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SOME ABUSES OF CONDUIT CONSTRUCTION.

A recent writer on the evolution of wiring systems argued that in the case of open knob or cleat wiring the fact that the conductors are exposed to plain view generally leads to the circuit being treated to such consideration as to safeguard it largely from disturbance. It was also contended by this writer that in many localities a scarcity of wiremen skilled in conduit work often makes the installation of other types of wiring preferable to conduit construction.

As plausible as the first of the two foregoing arguments might appear to the uninitiated, experience has shown that it is based on a premise which is largely false. The truth of the matter is that electric circuits are very rarely accorded any such tender solicitude as that assumed, and the degree of immunity from the possibility of injury to the circuit, either accidental or deliberate, after the installation of the wires, should generally be a large factor in determining the relative merits of different systems for distributing electric current within buildings. It may be added also that in no other class of wiring is the element of freedom from disturbance and consequently that of permanency comparable with that possessed by those systems in which some type of metal-armored circuit is employed. It is mainly for this reason, indeed, that various electrical-inspection boards throughout the country, and many contractors as well, are insisting upon a more general adoption of conduit wiring.

So far as the opinion as to any scarcity of wiremen, skilled in the installation of conduit is concerned, it appears that where faults have developed in conduit circuits the cause has usually been carelessness on the part of workmen and inspectors rather than a lack of ability to install the work properly. It does not seem, for example, that special skill or long experience should be necessary to convince a wireman that electric conductors may be damaged by the application of excessive force in pulling them into a run of rigid conduit. And yet, when a ground or short-circuit occurs within a pipe it is not at all improbable that, in a majority of cases, the trouble could be traced to this particular source. In the hands of the careful wireman, the block and tackle may possibly be a legitimate and useful appliance for pulling in the conductors in the installation of conduit work; but the use of it to force wires

past an excessive number of bends and offsets, or to pull in a larger number of wires than should be allowed in a single tube, is a practice which is distinctly bad and likewise altogether too common.

It may be remarked in this connection that short-circuits in rigid conduit systems attributed to the presence of water are doubtless often really due to the fact that the conductors were damaged during the installation of the circuits. At any rate, water within the conduit has been accepted as the cause of the difficulty in cases where its presence could be explained only on the assumption that it had been allowed to get into the pipes while the building was being completed, which occurrence would hardly seem probable. Relative to the accumulation of moisture within rigid conduit, it is to be noted further that experienced electrical inspectors have given it as their opinion that in buildings where the conditions are really such as to lead to excessive condensation inside the tubes, satisfactory results could often be assured by installing these so that they would drain to convenient outlets for water.

The question of better insulation tests in the inspection of interior wiring is one in which certain inspection boards are apparently becoming considerably interested now, and in view of the foregoing conditions the movement in this direction would seem to be most opportune and timely. This subject came up for consideration, for instance, at the recent convention of the Western Society of Electrical Inspectors, at Milwaukee, and a specialist was appointed to make the necessary study of the subject and report the result of his investigations to a committee of the Society at a later date. It is evident that thorough insulation tests between the conductors and the conduit, and between the various conductors themselves is one of the most effective methods of insuring uniformly good work on the part of electricians installing conduit systems. The general adoption of such tests, and the discontinuance of the too frequent practice of installing a greater number of wires in one run of conduit than the Code allows, would obviously mean much for the improvement of conduit construction generally.

THE ELECTRICAL EXPORTS FOR THE PAST YEAR.

In another part of this issue are given somewhat detailed statistics relating to the electrical exports of the United States for 1911. That year was a banner year for this foreign trade. The total value of its electrical exports was nearly $2,000,000 greater than in the year 1907, which formerly held the record. There has been material improvement in both electrical-machinery and appliance exports during the last few years since the heavy slump at the close of 1907. The machinery shipments have not quite reached the level that they held in that year, but the appliance exports have increased steadily until last year they exceeded the shipments of 1907 by nearly 50 per cent, and were nearly double the appliance exports of 1908.

While these achievements are exceedingly gratifying, they should lead to still further development of our foreign trade. South America should be a market for our manufacturers to a much larger extent than it now is. The opening of the Panama Canal next year should be anticipated by careful study of the requirements of the Latin American countries, so that the advantages accruing to our shippers may be availed of to the fullest possible extent in a greatly increased export trade with these countries that are a natural market for our products.

PRODIGALITY IN ELECTRIC LIGHTING.

A writer in the *Electrical Times*, our English contemporary, Mr. E. E. Sharp, has given his impressions of America, obtained during a recent visit to this country. He considers extravagance one of the prominent features exhibited in this country and gives several examples involving prodigality in electric lighting, such as the ferry boats in New York harbor, the street lighting in many of our cities, the outline lighting of buildings and the lighting of hotels. In an editorial comment upon this article the inquiry is put to English readers, "Are we too thrifty?"

The economic philosopher will naturally condemn every evidence of extravagance which is apparent in places where the misery due to extreme poverty also exists. Under our present social order, however, prodigality in the consumption of the products of human labor does not necessarily involve the lack of the necessities of life to the poor and unfortunate, but is rather more likely to have the opposite effect. We live in a country which is rich in natural resources and which can easily support a much larger population than it now contains. After the labor necessary to provide the people with the necessaries of life has been performed, either work must cease or labor must be turned to those things which we consider luxuries and extravagances. Is it better to sit in idleness or to apply our surplus time and energy to the better lighting of our streets, our ferry boats and our residences? These things may be termed luxuries or extravagances, but is not every contribution to a higher standard of living over the mere necessities of food, shelter, etc., to be classed in the same category as luxuries? If all of our unemployed could be set to work at providing similar luxuries for the common convenience, we should be even better off than we are now.

In an ideal social structure, where a large aggregate supply of the necessities of life meant plenty for every individual, it might well be claimed advantageous to limit extravagance in order to devote surplus time to the cultivation of the mind, the body and the spirit—to the education of the race, in the broadest sense of that term. But under present conditions, if one set of men produce more than they consume, it

means unemployment for others, who must become social parasites, either as exploiters of the workers or as objects of charity. Can the man hunting for a job to keep the wolf from the door think of cultivating himself? His greatest good will come rather from labor which is devoted to supplying his fellowmen with the material luxuries of life. Just as fast as the labor of the world is capable of producing an excess over present consumption, should the desires of the people be cultivated for more and better things. The more a country consumes, providing its ability to produce is not exceeded, the more prosperous is that country.

In England there is to be seen on one hand the greatest economy practiced not only in utilization of electric current but in almost every other field. The average consumer uses as little as possible of every store of supply, and limits his consumption to a minimum. On the other hand there is to be found the most appalling condition of unemployment among thousands of would-be workers that is to be found in the world. Would it not be economically preferable to have the consumption of every individual increased to the point where the labor of all the unemployed would be required to provide the necessary materials?

Certainly the cities of America could gain nothing by limiting the lighting of their streets and buildings to the minimum which would be considered necessary from the standpoint of the police force. Generous and efficient street lighting marks a real advance in civilization and is a condition to be emulated rather than to be adversely criticised. Not only from a civic point of view but also from a business point of view is adequate lighting to be advocated. In nearly all of those streets where lighting installations have been improved it will be found that an increase in business and in the property values has been the result. Certainly the cities of America must consider themselves more fortunate than their sister cities in England, and regard the indulgence in brilliant lighting as a very desirable extravagance.

WIRING CONVENIENCES.

The same author, Mr. E. E. Sharp, calls attention to the great lack, especially in hotel bedrooms, of two-way switches which would give control of the lighting circuits from more than one position in the room, as for instance from the door and from the bedside. This convenience is regarded as essential in every first-class English hotel. While our own hotels are much more lavish in their arrangements for wiring and in the number of lamps installed, they seem to have overlooked this minor point of convenience.

The same criticism might easily be made in regard to a great deal of the wiring which is done not only in public buildings but in private residences in this country. Entirely too little consideration is given to the little conveniences which might be very easily installed at slight expense in almost every room. The causes for this are perhaps not far to seek; the builder of houses for general sale usually aims to make his construction just as cheap as possible for a given showing and the average purchaser is not familiar enough with electrical equipment to insist upon anything more than the mere presence of electric wiring. Similarly, if he builds for himself he depends largely upon his architect or the contractor to put in the necessary wiring, and usually considers little more than the position of the lighting fixtures, even when he decides this point himself. It is entirely too customary to put in any regulation fixtures and switches which may be habitual with the contractor.

An experience of the writer will show how unusual it is for a fixture contractor to handle anything but the regulation schemes. It was decided to control an electrolier by means of a pendent switch and to have two independent circuits in the fixture. It was necessary to inform the contractor where he could obtain the pendent double switch, and it was also necessary to show him how the fixture must be wired in order to control the lamps in the manner which had been planned.

In order to give the greatest satisfaction to customers, the contractor or the central-station solicitor with whom a customer confers in regard to a new installation of wiring should offer all the suggestions he may be able to think of for adding to the convenience of the installation. Too often these possibilities for greater convenience are not realized until after the installation has been made, and then it is neither easy nor inexpensive to make a change, although the result could probably have been obtained by a very slight change at a very slight expense in the original layout.

AN ADVANTAGE OF ELECTRIC COOKING.

One of the advantages of electric cooking which should appeal to the housewife is the fact that a moderate temperature may be used, with a resulting preservation of weight and bulk of the material, as compared with flame cooking at high temperature. The result is not only an improvement in the quality of the material after cooking, but it has been shown recently in the *Standard* that it may actually affect the amount of the butcher's bill. Figures are given covering four years for a family of six persons, who, as far as is known, partook of meat just as often in the two years under electric cooking as in the two years under the use of gas. There was a slight increase in the expense for heating, cooking and lighting, amounting to from $10 to $25 per annum. There was a decrease in the butcher's bills, however, amounting to $80 per annum.

The statement that the shrinkage and evaporation is much lower with electric cooking is substantiated by a caterer's journal, which estimates this loss as low as six per cent with electric cooking, whereas it reaches 18 to 20 per cent with other methods.

Philadelphia Jovians Plan Extensive Co-operative Work.

The Jovian Electrical League of Philadelphia has cut out for itself a very busy line of work. It is proposed to get together for harmony and co-operation all of the electrical interests of the city, and one of the first objects of the fraternal movement will be to carry out a plan of co-operative advertising for the popularization of electricity in Philadelphia. The prominent dealers and contractors in the city will group their advertising on a prominent page of one of the leading dailies similar to the co-operative electrical page now being published successfully in Cleveland, Denver, Pittsburgh, Youngstown and a half-dozen other cities.

The Philadelphia Jovians held a meeting at the Hotel Bingham on Thursday, February 1, and a rejuvenation on Friday, February 2, at 8 p. m.

This movement is being led by Washington Devereaux, Jovian Statesman for Pennsylvania, and the active workers on the committee include J. D. Israel, Philadelphia Electric Company; G. L. Thompson, General Electric Company; James A. Vaughn, H. C. Roberts & Company; William T. Pringle, W. T. Pringle Company, and Gilbert S. Smith, J. F. Buchanan & Company.

Electric Club of Chicago Changes Day of Meeting.

At the annual meeting of the Electric Club of Chicago, held February 7, the regular weekly meeting day was changed from Wednesday to Thursday.

The election of officers for the ensuing year resulted as follows; this being the regular ticket proposed by the Nominating Committee:

President, A. A. Gray.
Vice-President, Perry Boole.
Secretary, W. R. Connelly.
Treasurer, John R. Harmon.

The new board of managers consists of W. D. Roper, N. F. Obright, H. G. Hafner, J. R. Cravath and the above officers.

Chicago Section of Electrical Vehicle Association of America.

Active work is under way for the establishment in Chicago of a section of the Electrical Vehicle Association of America. According to the constitution of the parent body, a petition endorsed by 15 active members is necessary for the establishment of a geographical section. Although the movement for a Chicago section has only been seriously considered for two days, George H. Jones, power engineer of the Commonwealth Company, who is fostering the movement, has already secured 10 signatures.

Canada Adopts National Code for Rubber-Covered Wire.

As the result of a conference held on January 18 in the city of Toronto, Canada, at which were represented all the *bona-fide* rubber-covered-wire manufacturers of Canada and the electrical inspectors, it was agreed that on and after January 1, 1913, only rubber-covered wires and cables having insulation in accordance with the National Electrical Code, 1911 specifications, would be made and required by electrical inspection departments throughout the Dominion of Canada.

While the question of factory inspection and label system under the supervision of the Underwriters' Wire Inspection Department was discussed with A. R. Small, superintendent of the Label Service of the Underwriters' Laboratories, Incorporated, who was present, the Canadian manufacturers have not decided whether they will accept this factory-inspection and label system, but will discuss the matter among themselves, later.

Electric Sign Withstands Fire and Water.

On Saturday, January 20, 1912, the Marshall Drug Store building, fronting on the west side of the Public Square of Cleveland, O., was swept by fire, which left only the shell of the building.

For a number of years the largest and most prominent electric signs in the city have been located on this building. At present the largest of these is the Goodrich Tire sign, which was erected and is operated by the A. & W. Electric Sign Company, Cleveland. This sign, the letters of which are six feet high, contains in the neighborhood of 900 Mazda lamps of the 2.5-watt, 11.5-volt sign type.

As the weather at the time of the fire was very cold, the large quantity of water which was used to quench the flames froze quickly, causing the building to be coated with ice. The large signs received their share of the water from the fire hose and were also heavily coated with ice. When the current was turned on at night, the signs were found to be none the worse for the conflagration, there being only one lamp destroyed. This speaks well for the wiring construction as well as for the ruggedness of the lamps.

California Gold Dredging.

At the meeting of the American Society of Mechanical Engineers in the Engineering Societies Building, New York City, on February 13, at 8:15 p. m., a paper will be presented by Robert E. Cranston entitled "Notes on Design and Mechanical Features of the California Gold Dredge." The American Institute of Mining Engineers will co-operate in this meeting.

The General Railway - Terminal Situation in Chicago.

Speaking on this subject before the Electric Club of Chicago, on January 31, L. C. Fritch, chief engineer of the Chicago, Great Western Railroad, pointed out that the ultimate electrification of all railway terminals in Chicago is inevitable, but before the directors of the railroads will authorize the expenditure of vast sums of money for this work electrical engineers must devise some system that will be mutually interchangeable between all roads. Equally important is the necessity for the unification of all passenger terminals and the design of a system for interchangeable freight traffic.

In emphasizing the necessity for unified railway terminals, Mr. Fritch presented statistics showing the high proportions of the railway business in Chicago. There are over 30 trunk lines that terminate in the city, these roads representing one-third of the entire mileage of the United States, and making Chicago the greatest railway center in the world. Ten million freight cars are handled annually in the Chicago district. Mr. Fritch indorsed the plan, previously brought before the public, of locating all passenger terminals south of the business district, near Twelfth Street, which location would be accessible to every road entering the city.

One of the important advantages of electrification and one which, according to Mr. Fritch, would pay the interest on the investment necessary, would be the elimination of the present-day train sheds which could be replaced by modern structures, built over the train sheds, thus making available valuable floor space.

Referring to electrification of suburban lines, Mr. Fritch states that, perhaps with the exception of two roads, it would be impractical to electrify. Exceptionally dense traffic is necessary to make it a success financially. In this connection Mr. Fritch discredited stories relative to the feasibility of employing storage-battery locomotives for heavy-traction service.

In conclusion brief mention was made of the "Chicago Plan," the success of which depends upon the co-operation of the railroads in electrifying their lines.

Telephone Used Between Boston and Denver.

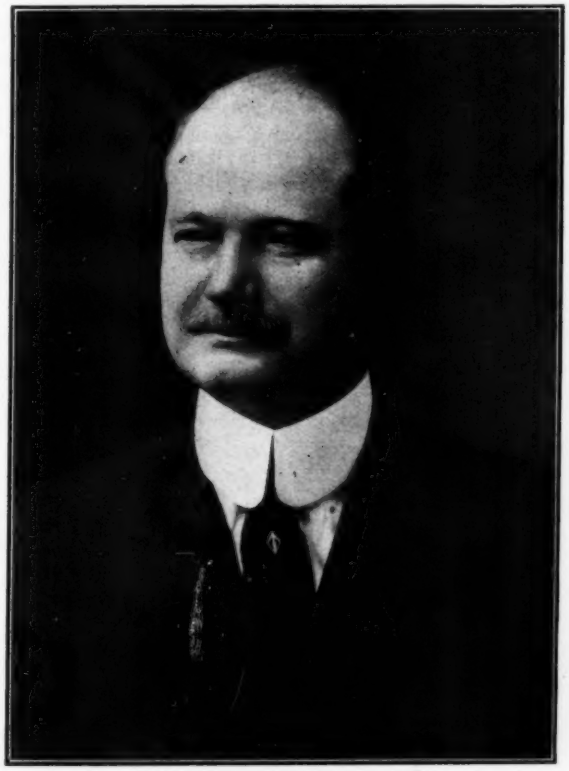
A record for long-distance telephone conversation was established January 12, when connections were made between Denver and Boston, a total distance of 2,400 miles. Connections were made through five toll boards, including New York City. No trouble was encountered, conversation being carried on with ease.

Bert Houghton.

The construction department of the big central station of today is one of the big ends of a big business. To plan for the layout of modern prime movers, generating apparatus, fuel supply, boiler equipment, and transmission apparatus, the work of a genius and the experience of a master are required. Thirteen years as construction engineer of the Edison Electric Illuminating Company of Boston means that Bert Houghton has not only won his spurs, but is wearing them every day.

Mr. Houghton is the kind of fellow who does things—he has done several big ones. For instance: he landed in St. Johnsbury, Vermont, as a boy with $26 in his pocket, and wanted to know of the principal of the St. Johnsbury Academy if there was any chance for a boy to work his way through. The principal's reply was very discouraging, so Mr. Houghton asked if he could stay $26 worth. When he had used up his $26 worth of "stop-over privilege," he had made so good an impression that the principal was won over. Mr. Houghton graduated from the St. Johnsbury Academy with $200 to the good, having supported himself and paid all his bills meanwhile.

After being graduated from Cornell University ('92), he associated himself with E. D. Leavitt, the well known expert in steam engineering, and worked in the latter's Cambridgeport (Mass.) office on the designs and testing of machinery for the Calumet & Hecla Mining Company. He also had a great deal to do with the development and installation of the high-economy pumping engines built for the big Chestnut Hill Reservoir water service in Boston.



Bert Houghton,
Of the Edison Electric Illuminating Company, Brooklyn.

Mr. Houghton joined the Boston office of the General Electric Company in 1894, and, being connected with the motor department, laid out the first motor-driven gun-carriage for coast-defense service in the United States. He gave special attention for some time to the mechanical problems incident to electric motor-driving, including mail-carrying equipment and mill machinery. He then became associated with Lockwood, Greene & Company, Boston, mill architects and engineers. While with them he laid out the first block electric plant in the city of Lowell, Massachusetts. This was built for Arthur E. Childs, now president of the Massachusetts Lighting Companies.

In 1899, Mr. Houghton began designing work for the Boston Electric Light Company under the late F. A. Gilbert, and his big work there was the laying out of the plans and specifications for the original 6,800-kilowatt generating plant in South Boston. That plant had four engine-driven units of 1,700 kilowatt rating, with a big installation of Brush arc-lighting generators direct-driven by synchronous motors. There were also switchboard facilities for alternating-current service and street-lighting distribution control. That big plant (for those days) was laid out so accurately, and the piping details arranged so carefully, that no templates were required in its construction. That was the first unit-type station, with boilers, engines, generators and auxiliaries arranged for independent but co-operative service built.

The Boston Edison Company, which, in the early days, was a rival of the Boston Electric Light Company, engaged Mr. Houghton for the remodeling of the Atlantic Avenue station, from which the three-wire direct-current service for the Boston center-city was established. Since the consolidation of the two electric lighting companies under the present Boston Edison organization, Mr. Houghton has been associated with the construction bureau in charge of all installation work of a mechanical character, including buildings, coal-handling equipment, steam plants, wharves and mechanical details of great variety. Mr. Houghton has superintended about forty important installations, including substations. On February 1 he began his duties as assistant to Harry P. Wood, superintendent of the construction and operating, department of the Edison Illuminating Company of Brooklyn.

Before leaving Boston, some 75 officials and representatives of the company gave Mr. Houghton a fine banquet in the Dutch Room of the Copley Square Hotel in Boston, and he was presented with a fine traveling bag.

Engineering Society of Wisconsin to Hold Meeting.

The fourth annual meeting of the Engineering Society of Wisconsin will be held at Madison, February 14 to 16; headquarters will be at the Engineering Building of the University. Sessions for the reading of papers will be held on Wednesday afternoon and evening; Thursday morning and afternoon, and Friday morning and afternoon. Among the papers is one by T. D. Crocker on "Central-Station Heating" and one by F. A. Vaughn on "Accuracy of Recording Meters and Best Methods and Standards of Testing."

Wireless from Hawaii to Washington.

On February 3 wireless communication was held between the United States navy fleet at Honolulu and the office of the department in Washington, the message being relayed by the stations at Mare Island Navy Yard and stations at Mar Island Navy Yard and Key West, Fla. The transmission was effected in daylight over a distance of 2,100 miles from Honolulu to Mare Island, and 2,200 miles from Mare Island to Key West. This is an unusually long distance for day messages.

Arkansas Public Utility Operators' Meeting in May.

The Arkansas Association of Public Utility Operators will hold its fifth annual convention at Little Rock, May 20 to 22. W. J. Thorpe, of the Little Rock Railway & Electric Company, is secretary. A good program is being arranged.

Fire Record of Electric Light and Power Stations.

A study of the statistics in the fire record of electric light and power stations shows some very interesting points in connection with this class of plants. The fires which originated from common causes outnumbered the special-hazard fires nearly two to one. Boiler and lightning fires are the most prominent causes. In connection with the boiler fires, the fact that one-third of these originated because of the iron stack being improperly protected, renders our article on this subject of special interest. In the special-hazard fires, electric wiring, either defective or by reason of crossed circuits, was productive of the greatest trouble. The preponderance of common causes over special-hazard fires would seem to show the effectiveness of the present practice in safeguarding electrical hazards.

Our records show that only two fires occurred in plants of fire-resistive construction. A little over one-third of the buildings were brick and wood construction. From the reports as given, it would seem essential to establish fire divisions between a boiler and generator room, especially in plants of compound occupancy as, for instance, light and water-works stations.

Over three-fourths of the plants were devoted to the production of light or power. A study of the losses would seem to indicate that a power house was subject either to a total loss or to comparatively slight damage. The largest percentage of losses on contents alone were heavy losses. One-fourth of the fires occurred in or around boiler rooms, and nearly one-fourth more were divided between generator rooms and transformer houses or rooms. As might be expected, two-thirds of the fires occurred at night, and the greatest percentage while plants were in operation. This would account also for the large number of fires which were discovered by employees.

Conclusions.

Electrical machinery operating in multiple and having rapidly revolving parts carrying heavy copper conductors should be so equipped and controlled that a short-circuit within a machine will automatically stop generation in the defective machine and disconnect from the system.

High-voltage conductors and apparatus should be protected from possible flying particles of metal, preferably by inclosures of non-combustible material.

Switchboards should be so located or guarded that operators may manipulate controlling devices in safety.

Quick-acting valves controlling turbines should be so located in all hydro-electric plants that water may be promptly cut off by closing valves at a convenient point outside the generator room.

Ventilators or other roof structures of frame construction are a menace even on unexposed generating stations.

Power houses having roofs composed of combustible material are always liable to serious damage, especially where remote from fire protection; but where a wood roof is unavoidable, the heavy mill type is least objectionable.

Roof coverings having good fire-retardant qualities are absolutely essential to the safety of power houses.

Frame air chambers for cooling transformers, and similar construction work creating concealed spaces which may conceal the presence of fire, constitute an unnecessary fire danger.

Combustible supplies, especially waste, whether clean or oily, should be kept in covered inclosures or tanks constructed of non-combustible material.

Standpipe and hose equipment with ample water supply and pressure to produce effective fire streams are indispensable to the safety of power houses having combustible roofs or floors or containing combustible materials in quantities. This is particularly true of stations remote from public protection.

Ladders, fire axes, pike poles and crowbars should be provided for all power houses having roofs, roof structures or other construction work of combustible material. These appliances facilitate prompt access to all parts of the building and expedite the removal of all combustible construction work which may conceal fire, or otherwise impede the work of extinguishing it.

Electrical generators and motors of comparatively low voltage rating are more liable to damage by heat than by water where small fires are concerned.

Cool, determined, resourceful leadership, coupled with good judgment, is the most important factor in the saving of property in time of fire.

The transformer-station fires are of considerable interest. Owing to the large quantity of oil, transformers have been thought to offer a considerable fire hazard. Unless proper precautions are taken, this is true. Transformer oil itself will not take fire unless raised to a temperature of approximately 400 degrees Fahrenheit, and unless supplied with ample oxygen. The only other danger is said to be from the oil vapor that is given off from hot oil, which when mixed with a proper proportion of air gives a highly explosive mixture. This may develop a pressure of 100 pounds per square inch. It is very easily ignited by a spark. It is difficult to build transformer tanks absolutely oil-tight, and as oil exposed to the air burns readily, it would not seem advisable to dry out transformer oil by fire under the transformer, unless there were only the oil of the transformer to be endangered. This is sometimes taken out of doors where the fire risk to other apparatus is eliminated. As it is practically impossible to ignite oil from the inside, even by arcs of considerable power, the only danger of transformer oils comes from an arc very near the surface of the oil, or from an outside source altogether. In a fireproof building, the one thing that would ignite oil would be to build a fire under the transformers. An interesting fire is recorded, caused by the ignition of escaping oil from a transformer which was being heated by a charcoal fire. A close watch should be kept for such fires at all times. When such a risk is to be taken, a good supply of sand should be close at hand to be used in case a small fire should start. As water only spreads the oil and exposes it to more air, it is more of a hindrance than a help. Chemical extinguishers prove very satisfactory in fires of this nature, but sand is even more effective. If local conditions are such that a steam jet can be used advantageously, this is very effective in extinguishing fire if the space is not too large and the steam can be confined. If considerable oil is used, a quick method of draining the oil should always be provided. Good authority states that large insulated transformers should always be built of boiler plate, which will not easily melt and allow the oil to flow out, and should be provided with some form of safety valve which will relieve any pressure that may develop and yet not expose the oil to any amount of air. Oil vapor ignites with ease, and for this reason, open flames should not be allowed in the vicinity of hot oil. It should be the practice to dry transformer oil either by immersing heating coils in the oil or by employing a dehydrating agent, such as lime, or by blowing air through warm oil. When heating coils are used, the heat is applied below the oil surface, where it is impossible for ignition to take place.

The following specifications have been suggested for a fireproof high-voltage substation: building to be of fire-resistive construction; incoming circuits dead-ended on suspension insulators, with disconnecting knife switches and taps which provide for the by-passing of the substation; lightning arresters in separate wing of fireproof construction; oil switches to be mounted in separate structure containing no inflammable material; rolling steel doorways with padlocks for all independent structures carrying high-potential wiring; wired glass windows and skylights; all interior lower-tension wiring in conduit, with remote control of oil switches for incoming and outgoing services; marble or slate busbar compartments with approved insulating barriers; carriage, track and winch for removing transformers; and the allowance of extraordinary space for the clearance of all high-voltage leads.—*Quarterly of the National Fire Protection Association.*

Rural and Domestic Applications of Electricity.

By Frank Koester.

Rural Central Stations.

A policy much adopted abroad, particularly in Germany, where the government makes a thorough examination of electrically operated farms, is to install rural central stations for the purpose of supplying a number of farms, rural industries, country residences and estates with electric current. By establishing a rural central station, either steam, water, oil or gas plant, a great saving in the production of electric energy may be readily secured. Today we find in Germany as many as 100 to 150 consumers being supplied with electric energy from one of the numerous rural central stations which have been installed within the last fifteen years.

Also in nothern Italy and throughout Switzerland, there is a rather conspicuous use of electrical energy in agriculture and in small rural communities. A network of distributing lines has been formed, owing to the interconnection of numerous scattered sources of hydroelectric power. The Swiss and Italian land proprietors and small farmers, and in fact those throughout west Europe, have taken to the use of electric light and electric power, and give today exceptional examples of the advantages of this practice.

To what an extent a single rural central station may supply a farming community with electrical energy, the rural station of Besswitz, Germany, may be cited. The distribution system is 145 miles long, the central station being as nearly as possible at the center of the network; the point of the greatest distance from the station is 26 miles. The territory served is equivalent to 102,000 acres, of which 40,000 acres are cultivated with the plow. To this transmission system are connected 180 electric motors and about 5,000 lamps, with a total consumption of 1,300 kilowatts or 1,780 horsepower.

The energy is sold on a sliding-scale basis; six cents per kilowatt-hour for lighting purposes, and for power loads the rate varies from two and a half to four cents, depending upon the quantity consumed per day, the larger the amount the lower the rate.

Another interesting instance is the central distribution system of Lottin, Germany. Here a waterpower plant of 300 horsepower is utilized. During certain seasons of the year the water is at low level and, to help out, a steam-electric generating set of 180 horsepower is put into service. It is obvious that this set can be pressed into service at any time should the demand exceed the capacity of the hydroelectric station.

The electric energy is used on 61 farms including rural industries, and five villages, a total of 24,700 acres. The distribution system is 82 miles long. There are altogether 102 consumers served, with some 150 motors, and a total connected load of 1,500 horsepower; 4,850 incandescent lamps and 20 arc lamps comprise the lighting part of the load.

During the year 1908, there were consumed 440,000 kilowatt-hours, which

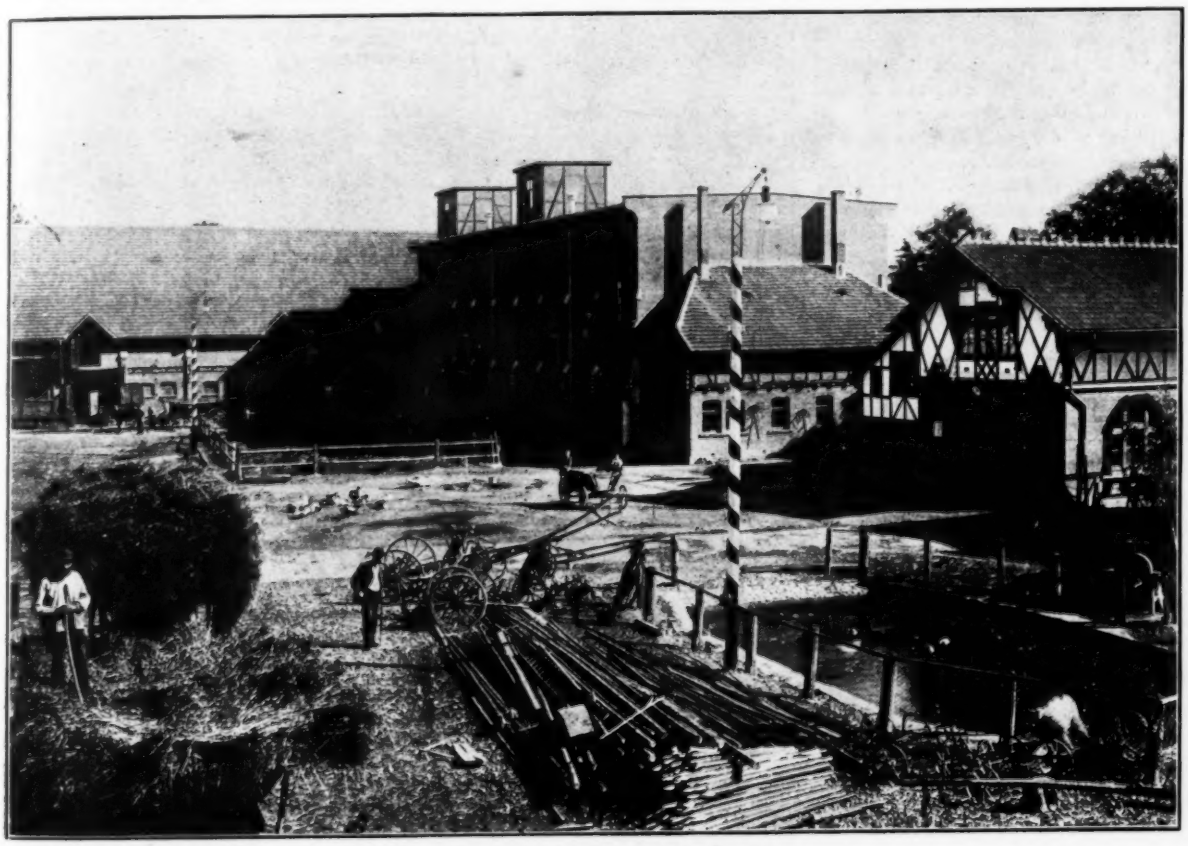


Fig. 1.—Electric Lighting in the Barnyard.

were sold at the average rate of three cents per kilowatt-hour for power and six and a half cents per kilowatt-hour for lighting.

It may be of interest to give an itemized account as to how the energy is consumed. There are 50 farms with a varying acreage of from 60 to 1,800 acres per farm, under cultivation by the plow; of the former there are eight, while of the latter there are six, with a total of 275 horsepower in motor drive, 1,200 incandescent lamps and 20 arc lamps. There are some twelve farms from 300 to 600 acres having 12 motors with a total capacity of 122 horsepower.

Many of the German farmers have rural industries connected with their farms whereby they utilize their by-products, and herein lies the secret of success of many well-to-do farmers. For instance, in the last-mentioned central-station system, there are connected four grist mills, with five motors, having a total capacity of 105 horsepower; one tile works with 40-horsepower motor; one saw-mill with a 20-horsepower motor; four wheelwrights have motors consuming 16 horsepower; and using motors of varying capacities are other industries, such as cabinet making, distilling, blacksmithing, bottling works, etc. There are also connected with the system some 20 consumers for lighting only, with a total of 343 incandescent lamps and five arc lamps; one railway and freight station with 120 incandescent lamps and six arc lamps. Further, there are two towns supplied, with a total of 1,692 lamps.

From the above facts and figures, it is obvious that electricity can give a new stimulus to agriculture and farming, and at the same time open up a new way by which the rural population can be induced to remain on the farm instead of flocking to the cities and to take up an entirely new branch of service in order to earn a living.

Central-Station Service.

In many instances there are lines from city or other electric stations passing farms and rural industries. In many of the states throughout the country the long-distance transmission lines of many hydroelectric plants pass through farming communities more or less densely populated. These systems are usually high-tension, varying from 12,000 to 60,000, even as high as 100,000 volts. These high voltages are not used directly in motors for any purpose; the voltage must be reduced by transformers to a suitable value, depending on the nature of the purpose for which a motor is to be used. Likewise for farm and country residence use, a transformer must be used for the same purpose, that is, to furnish a supply of current at a low voltage for local distribution.

Where large tracts are to be covered on a single farm, practice has proven that a voltage of about 12,000 is most suitable; intermediate portable or stationary transformers stepping the voltage down to that desired on the motors of the plows, threshing machines, etc.

Fig. 2.—Motor-Driven Pump.

Electrical energy from central-station services is usually sold on a sliding scale basis; that is, the larger the consumption the lower the price per kilowatt-hour. Again, the larger the consumption at a certain hour of the day, when the load on the central station is low, the cheaper is the rate obtainable. As most industrial enterprises, farms, etc., have their motors operating in the daytime, giving a good load factor, power may usually be sold at a lower rate than that charged for energy used during the evening.

Rural Power Distribution.

Electrical energy is distributed on both high-tension and low-tension systems; the former being used for long transmission systems and the latter for local distribution. For high-tension lines alternating current is used, while for low-tension distribution, direct current is used. Hard and fast rules cannot be laid down as to the use of al-

Fig. 3.—Hydroelectric Generating Station on a Farm.

ternating or direct current for rural distribution. It altogether depends on the conditions of each installation. In making comparisons between the two systems, however, the following points may be of interest: In direct-current transmission, the line construction is of very simple character; only two wires are required, strung on a single-pole line; the insulators are simple in construction and of comparatively low cost. For these reasons, a high degree of reliability against breakdown is assured. Direct current may be used as generated in the generating plant, directly for the power and lighting system. Further, the power motors connected with the various farming implements can be connected to the distribution system for lighting. However, where large power motors are connected to direct-current lighting circuit, it is preferable to run a saparate power circuit, as otherwise in starting and stopping the motors severe fluctuations in a lighting system may occur. Direct-current motors have a slightly higher efficiency; they are more compact in construction than alternating-current motors, and they will generally carry greater overload capacity.

Fig. 4.—Typical Farm Transmission Line, with Lightning Protectors and Telephone Line.

The speed regulating and starting device of these motors as well as the wiring system, is very much simpler and cheaper than that of the alternating-current motor system. As indicated, the direct-current transmission system should not be used for long-distance transmission, as the current cannot be transformed without the medium of motor-generators which are direct-current transformers. These latter are more expensive than the static transformers used in connection with alternating-current systems.

The advantage of alternating cur-

Fig. 5.—Farm Electrically Operated and Lighted by Windmill Generating Set.

rent can best be realized when high voltage is applied. A distant water-power can economically be utilized with this system and the voltage can be stepped down to the pressure desirable at the point of consumption. The transformers are, of course, extra items of expense, and owing to the power-factor characteristic of alternating current, larger generators and motors must be used in place of equivalent direct-current machines. Therefore, these machines are slightly more expensive than direct-current apparatus of equivalent capacity; also the regulating devices are more complicated and more expensive.

Considering the additional equipment which is necessary in high-voltage alternating-current transmission systems, it will be noticed that the efficiency is slightly less than in a direct-current system. However, these disadvantages are outstripped by the possibility of transmitting alternating current long distances. For instance, in present practice, alternating current is being transmitted some 280 miles, while direct current seldom is transmitted more than 15 miles. By the use of alternating current, cheap fuel or waterpowers at a distance may be utilized. Central station companies readily supply farmers and other rural industries without much expense or inconvenience, making connections to their transmission system, which in many instances runs through the farm properties.

In many instances current is wanted in a certain section of the field for a short time only, and to install a stationary transformer would be poor policy. To fill such an emergency, a portable transformer is used. It is mounted on wheels and is drawn by two horses. It can be placed in position in a short time, and can be returned to the barn after the work is done. Being portable, there is this advantage, that a number of farmers can own such a transformer in common, and good saving in first cost is thereby gained.

The accompanying illustration shows a typical high-tension line running through a field. The three upper lines are used for transmitting electric power at high voltage, the two lower lines are for the rural telephone system, so that communication between the operator of the farming machinery and the central station can readily be established.

Iowa Electrical Association.

The Iowa Electrical Association will hold its annual meeting in Des Moines, Iowa, April 24 and 25. The Iowa Street Railway Association will meet on April 25 and 26.

Growth of Copper Industry.

The growth of the copper industry in the United States has been notable, according to the figures of the United States Geological Survey. In 1850 the production was 1,456,000 pounds; in 1870 it was 28,225,000 pounds; in 1890 it was 259,763,092 pounds; in 1900 it had increased to 606,117,166 pounds; in 1905 it was 901,907,843 pounds; and in 1909 it passed the billion mark with 1,092,951,624 pounds, decreasing in 1910, however, to 1,080,159,509 pounds. The price has decreased from over 46 cents a pound to an average of 12.7 cents a pound in 1910.

The United States is by far the largest copper producer in the world; in fact, we produce more than all the rest of the world together, the total world's production for 1910 being 1,903,297,003 pounds.

Who Owns the Power?

A dispute has arisen between the Government of New York State and the federal Government in regard to the ownership of the water power which will result from the construction of the new dam at Troy, N. Y. This is a part of the Barge Canal System. The improvement is being made by the United States, and the Secretary of War and the Attorney General hold that the water power created will be the property of the nation. New York State officials, on the other hand, claim that the water power will belong to the state.

It has been decided to settle the matter by a friendly suit in the courts, and meantime the work will not be interrupted. This case is considered a very important one, as it will set a precedent affecting future cases.

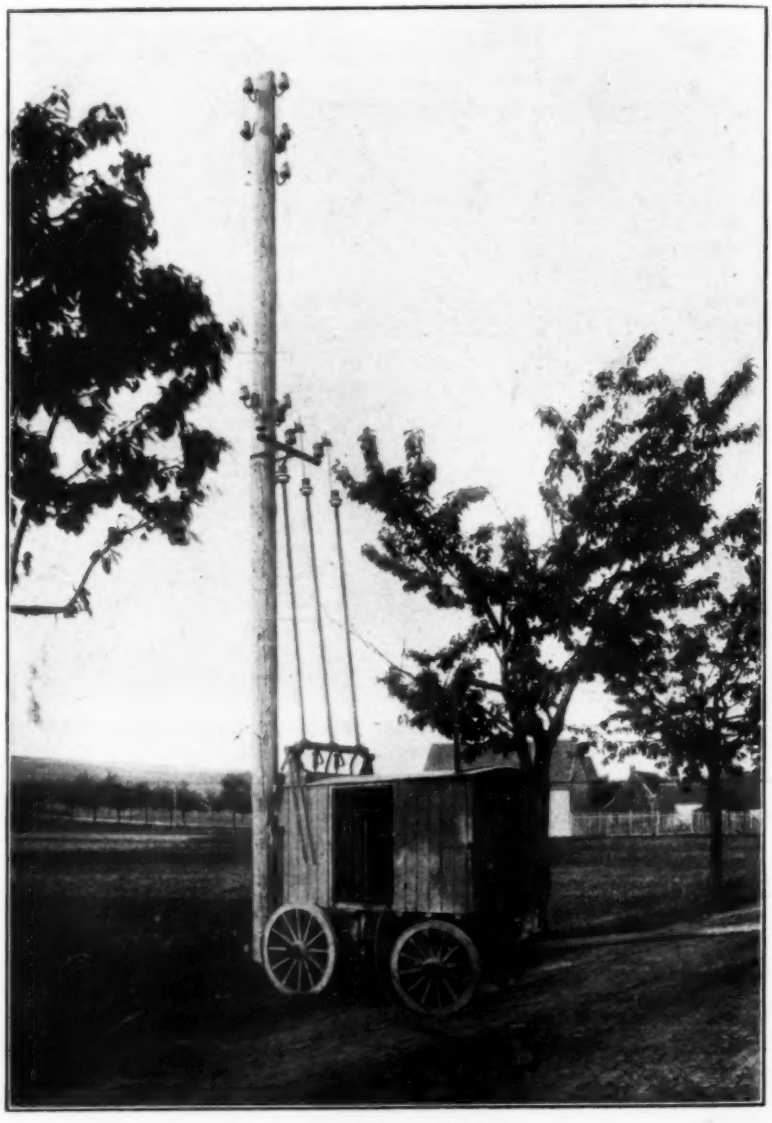


Fig. 6.—Portable Transformer.

Commercial Practice
Management, Rates, New Business

Central Station Converts Joliet into "City of Lights."

Joliet, Ill., has for many years been sorely in need of an adequate system of street lighting. Until recently antiquated arcs were the only means of lighting the business streets and, as trolley poles were also located on all of the principal thoroughfares, the streets were disfigured by a mass of poles along each curb line.

Recently it as decided by the Chicago & Joliet Electric Railway to replace its wooden trolley poles with iron poles. At the same time the Public Service Company of Northern Illinois, which furnishes current to the railway, concluded plans for placing all of its wires underground.

With these plans for the improvement of Joliet's streets concluded, Charles A. Munroe, general manager of the Public Service Company, conceived the idea of improving the street lighting by equipping each trolley pole with four arms supporting 60-watt tungsten lamps, thus obtaining all of the esthetic effects of a decorative lighting system, using ornamental posts, with a minimum expense and a minimum number of poles per block. The property owners and merchants were approached by the central-station company and an assessment of $1.25 per front foot per year agreed upon. This amount included the cost of installation and will cover maintenance, the city taking no part whatever in the transaction.

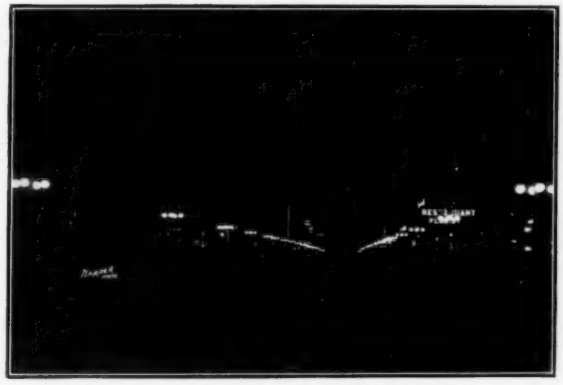
The two accompanying illustrations show night and day views of the new system, the latter showing the details of the converted poles. Twelve blocks are thus equipped and property owners and merchants on six or seven blocks not having trolley poles are conferring with the central station as to the cost of installing the regular ornamental posts on their streets. One block, adjacent to a lighted street, has already been equipped with these posts, which conform in every respect to the other installation.

Multiple lamps are used, they being of the 60-watt size, inclosed in 12-inch glass globes. The lamps are suspended 14 feet from the sidewalk level. The posts are spaced about seventy feet apart, there being ten poles to a block. All lamps, save two on each of the four corner poles, burn from dusk to midnight, the eight on each corner burning until dawn. A time switch located in the office of the central station controls the lamps.

The present system of lighting has been in operation for two months and, contrary to expectations, no breakages of lamps have resulted. It may be stated, however, that all lamps are provided with Benjamin shock absorbers. Considerable trouble was, however, experienced with globes breaking, but a novel scheme for remedying this was devised. The company purchased a number of old bicycle ties and cut them into washers which were placed on every globe. Since these were installed no breakages have been reported.

The entire lighting installation cost about $15,000.

Day View of Joliet Street-Lighting System.



Night View—Joliet, Ill.

Roseville Gets Low Rate.

The Great Western Power Company has been granted the contract to furnish Roseville, Cal., with electrical energy for five years at the rate of 1.5 cents per kilowatt-hour.

Central-Station Exhibit of Electrical Apparatus for the Farm.

Ever alert to the advancement of the electrical industry in all of its phases, the Edison Electric Illuminating Company of Boston is now preparing an exhibition of electrically driven apparatus which may be used upon the farm.

This exhibition will start on or about May 1, 1912, and will exhibit in the farming districts of the Edison Company's territory during the summer months, possibly exhibiting at the different agricultural shows in the territory during the fall.

The exhibition will be given in a tent 100 feet long and 60 feet wide, the walls of which will roll up so that the interior will be most attractive. The various articles displayed will be in operation and will be classified into different sections. In arranging for this demonstration of practical farming appliances two viewpoints have been considered.

First: to show the farmer a number of devices which can be driven by electricity, thus saving time and labor, and to impress upon him that when once electricity is installed upon his farm there are innumerable uses for which current can be used.

Second: to select the appliances with such care that the farmer will not be awed at the display and feel that electrically operated farm machinery is entirely beyond his means.

Particular attention has been paid to securing devices already commercially perfected so that exact duplicates of the apparatus shown can be furnished

at short notice. It is felt that the display of farming appliances will attract unusual attention, not only among farming people in the company's territory, but also among the manufacturers of farming appliances; for, while a vast amount has been written regarding the application of electricity on the farm, very little has actually been done.

This exhibition is to be in charge of the sales department.

Residence-Business Booklet.

The Residence-Business Committee of the Commercial Section of the National Electric Light Association held its second meeting on January 15 and 16. The meeting was attended by J. F. Becker, chairman; N. H. Boynton, secretary; G. B. Griffin, E. A. Norman, G. C. Osborne and F. D. Pembleton.

This committee has taken upon itself the very important work of compiling data, information and literature which will assist central-station companies to increase their residence business and to make it more profitable to them. In the search for accurate data each member of the committee is doing personal work, and also soliciting the assistance of central-station companies.

The committee has taken up its work with the view to handling the subject intelligently and enthusiastically; with the assistance of the central-station men its work will be successful. At present the members are compiling information for a booklet which will be printed for use by central-station companies in the direct-by-mail solicitation of residence business. This publication will comprise 24 pages and cover, 3 by 6 inches, and many central stations will use it in their campaigns for residence business.

Calendar of City of Lights.

The Denver Gas & Electric Light Company has issued a calendar which is illustrated by a color drawing made by Paul Gregg to commemorate the opening of the company's new building. It depicts the advancing civilization of the West by means of Indians, mounted upon bronchos, who are gazing from a nearby hill upon the splendor of the new home of the company, the illumination of which has been described in this journal.

Reduced Rates in Louisville.

Starting on February 1, 1912, the Louisville (Ky.) Lighting Company established a maximum rate of eight cents per kilowatt-hour for discount period, a reduction of two cents per kilowatt-hour from the former ten-cent rate.

Electric-Vehicle Service of the Denver Gas & Electric Light Company.

The Denver (Colo.) Gas & Electric Light Company has in service, at present, twelve electric trucks operating in different departments, distributed as follows: Four 3.5-ton machines moving coke; two 1,000-pound machines delivering gas meters; one 700-pound wagon for lamp renewals; one 1,000-pound truck delivering electric meters; two 700-pound machines used for emergency trouble orders, and one two-ton truck and one 1,000-pound truck in the electric line department.

The following table shows the comparative operating costs of one 1,000-pound truck and one one-horse wagon for setting gas meters during 25 working days:

	Truck.	Wagon.
Number of meters set	487	182
Number of meters returned	510	312
Number of meters changed	1,447	854
Number of miles run	765	No record
Expense of electric truck.		
Current used for charging battery		$ 9.50
Labor of man charging truck		12.00
Machine oil		10
Acid and distilled water		.70
One meter man		65.00
Interest and depreciation, 10 per cent (value $2,200)		18.40
Total cost per month		$105.70
Expense of one one-horse wagon.		
Board and stable, one horse, maintenance, veterinary, shoeing, harness and wagon		$27.50
One meter man		65.00
Interest and depreciation on horse (value $200)		1.66
Total cost per month		$94.16

From the table will be noted an increase of about 8.5 per cent in the upkeep of the electric; this increase is, however, offset by the 70 per cent more work accomplished. If the routing of this machine was similar to that of the horse-drawn wagon and not confined to outlying districts, a still greater increase could be expected.

These same averages apply to nearly all of the electrics in the service of the company. Figures on another 1,000-pound truck show a monthly cost of $216.30 as compared with $213.75 for the horse-drawn wagon, while 434 meters were handled by the electric as compared with 355. These figures show an increase of 1.25 per cent in cost of operation with a 21.9-per-cent increase in amount of work done.

Electric Range in Domestic-Science School.

The Louisville Lighting Company, Louisville, Ky., acting with the Board of Education, will install in the domestic-science department of the Girls' High School a complete electric cooking outfit, including range and appliances. The revenue from this installation is insignificant when compared with the advantages which will accrue from having the housewives of tomorrow become fully acquainted with the advantages of electric cooking.

Public-Policy Advertising.

There is good, sound logic in the following advertisement of the Union Electric Light & Power Company, St. Louis, Mo., which appears in the current issue of *Electric St. Louis Magazine*, under the heading, "Payrolls of Importance to a City."

"Millions of dollars are paid out by a public-service company to employees in the different branches of its business.

"Practically every cent of this money is spent in the city in which the company operates.

"This money is distributed by the company in weekly, semi-monthly or monthly payments to hundreds of workingmen and women.

"These men and women use their wages in buying food, fuel, clothing and other goods sold by merchants in that city.

"Every live, wide-awake city places a high value on its large industries, and works hard all the time to get more of them. That is the way cities are built up.

"Factories and big stores employing large numbers of wage-earners are often offered valuable inducements to locate in a city. There are many business organizations working entirely toward this end.

"It is of just as much importance to give proper support and encouragement to a large industry that already is established, and has become a part of the city itself, and a vital force in a city's activity and progress.

"A public-service company seldom, if ever, seeks a 'bonus' in cash, or a 'gift of land for a building site.' But in order that it may give the best possible service to the people themselves, and be of the greatest help in the growth of a city, it does need the friendship and co-operation of the people. It is entitled to it for the same reasons that secure it for other industries."

Rate Reduction in Virginia.

The Virginia Electric Power & Water Company, of Virginia, Minn., has made a reduction in the rates to small consumers, amounting to about 12 per cent. This is the third similar reduction within three years. Virginia has a graduated rate schedule, the maximum rate for the first twenty kilowatt-hours per month being now 10.8 cents.

Electric Vehicles Popular in Memphis.

In the four months since the Consolidated Gas & Electric Company, of Memphis, Tenn., established its electric garage, the steadily increasing use of electric vehicles has necessitated the doubling of its charging capacity.

Electrical Construction

NOTES ON ELECTRICAL CONSTRUCTION.

By George J. Kirchgasser.

This is the sixth of a series of articles on electrical construction. The matter is treated in a thoroughly practical manner, and covers every phase of construction usually encountered by the electrical contractor or the electrician in an industrial plant. This article discusses in detail some further types of electrical fittings.

Fuses in Common Use.

Fuses are employed in electrical circuits to prevent damage to wires or any apparatus or appliance connected to circuit due to the presence of a greater current than that for which the wires or appliances were designed. A fuse corresponds in function to the safety valve of a boiler. There are a number of types of fuses in more or less general use. The most widely used of these are the open-link type, consisting of a link of fuse wire; the Edison plug type, Fig. 1; and the inclosed or cartridge type, Fig. 2.

Fig. 1.—Edison Plug Fuse.

Fig. 2.—Cartridge Fuses.

The link-type fuse has a lead-alloy link connecting two tips made of copper or other similar metal which provide suitable terminal connections. Fuses of this type are sometimes used without terminal tips, but they are not satisfactory, as the alloy is soft and easily injured when clamped under screws.

Open link fuses are used mainly on slate or marble switchboards in dynamo rooms and the like, where the floor is concrete and therefore non-combustible. When these fuses blow, hot metal is caused to drop, which introduces a fire hazard. This type is also used to some extent in slate-lined cabinets, but their use is diminishing, while the use of inclosed cartridge types is increasing.

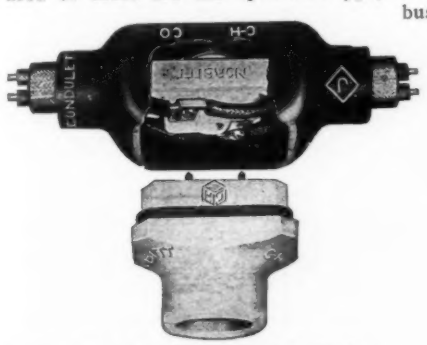


Fig. 3.—Receptacle and Conduit Fitting.

Fig. 4.—Molding Receptacle.

Fig. 5.—Fuse Bases.

Probably the commonest type of fuse is the Edison plug fuse shown in Fig. 1. This type is used mostly on incandescent lighting circuits where the voltage does not exceed 125. They are approved for this voltage in capacities up to 30 amperes. This, however, does not prohibit their use on, for instance, a 220 to 110-volt three-wire system, as with this system it is customary to run the branch circuits two-wire having a potential difference of 110 volts. At a three-wire service entrance of this kind the fuse may be omitted in the neutral wire if this neutral is grounded and is as large as one of the outside wires; otherwise an Edison plug fuse in each wire may be used if the voltage between the outside wires does not exceed 250.

Fig. 6.—Cartridge Fuse Clip.

The fuse wire in plug fuses can be seen by looking into the isinglass window at the top. Fig. 5 shows different types of bases for plug fuses.

The inclosed cartridge type fuse is made with knife-blade contacts and also with ferrule contacts (Fig 2). For circuits where the voltage is approximately 110 to 220, such as is found usually for interior circuits, the ferrules provide a sufficiently good contact surface up to a capacity of 60 amperes. Above that and up to 600 amperes and for voltages above 250, the knife-blade contact only is approved, because of the better contact it provides.

Another type of cartridge fuse which fits into a porcelain casing is approved for use on circuits where the voltage does not exceed 250 and for any capacity up to 60 amperes. This fuse can be used with the same fuse block as the Edison plug fuse. Upon the blowing of a cartridge fuse, replacement can be made by unscrewing the porcelain casing.

Fig. 7.—Plug Receptacle.

Styles of Fuses.

0-250 VOLTS.

0-30 *amperes*: (*a*) Cartridge fuse—ferrule contacts; (*b*) approved Edison plugs for voltages not over 125, but including three-wire circuits with grounded neutral and 250 volts between outside wires.

31-60 *amperes*: Cartridge fuse—ferrule contacts.

61-600 *amperes*: Cartridge fuse—knife-blade contacts.

251-600 VOLTS.

0-60 *amperes*: Cartridge fuse—ferrule contacts.

61-400 *amperes*: Cartridge fuse—knife-blade contacts.

It should be noted in this connection that the spacing of the metal parts of fuses is very important. Spacings

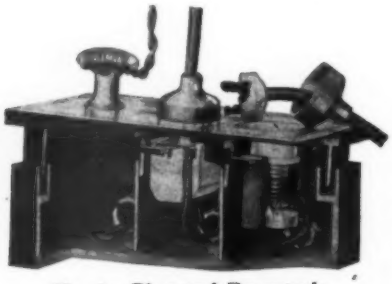


Fig. 8.—Plug and Receptacle.

for metal parts must be not less than the distance given in the table below:

Amperes capacity	Minimum distance between metal parts of opposite polarity	Minimum distance between metal parts of the same polarity	Minimum break-distance
0-125 Volts.			
0-10	¾ inch	½ inch	¾ inch
11-100	1 inch	½ inch	¾ inch
101-300	1 inch	½ inch	1 inch
301-1000	1¼ inch	½ inch	1¼ inch
126-250 Volts.			
0-10	1½ inch	¾ inch	1¼ inch
11-100	1¾ inch	¾ inch	1¼ inch
101-300	2 inch	¾ inch	1½ inch
301-1000	2½ inch	¾ inch	2 inch

For three-wire systems cut-outs must have the break-distance required for circuits of the voltage of the outside wires.

Receptacles.

The ordinary porcelain receptacle is a fitting into which a lamp or attach-

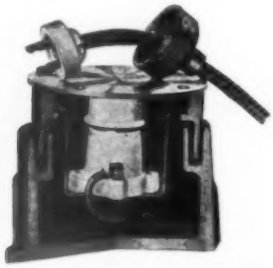


Fig. 9.—Adjustable Floor Box.

ment plug can be screwed. The inner shell is threaded to receive any fitting having an Edison base. Portable desk lamps, fans, heating devices, and other apparatus are usually plugged into receptacles. They are made in various types for use with open wiring, molding, concealed knob and tube wiring, and conduit wiring, and so on. Fig. 3 shows a type made for use with conduit and another type is illustrated in Figs. 7 and 11. For use in floors there are special waterproof receptacles and boxes made, and also for baseboards, for

Fig. 10.—Flush-Type Receptacle.

use in theaters and for electric signs, etc. The rating of these receptacles varies from three amperes and 250 volts, the most common size, to 20 and 25 amperes; 50-ampere receptacles being used for stage lighting and larger capacities for other special purposes.

Where an electric radiator or iron is to be used it is well to provide a receptacle and plug having a greater capacity than the three-ampere kind. In locations where moisture is apt to be present, as out of doors, in basements, breweries and abatoirs, weatherproof receptacles should be used. These are usually porcelain and the contacts are

Fig. 11.—Conduit Receptacle and Plug.

not exposed; but two rubber-covered terminal wires are provided for tapping onto the circuit wires. These taps should be soldered and then taped, first with rubber and then with friction tape.

Fig. 4 shows a Crouse-Hinds Norbitt molding receptacle. For ordinary inside open wiring, receptacles having a binding-screw on each side under which the bared circuit wire can be secured, are used. Fig. 3 is a Norbitt receptacle as used with a conduit system. The method of wiring the receptacle is also shown in this view. This receptacle can be used in any place.

Receptacles used in base-boards or in the walls of living rooms are of the flush type; that is, they are set in the wall, just as a flush switch. Receptacles placed in the floor are often used in residences and offices. They are convenient for use with table and desk lamps, and with fans, especially where desks or tables are located some distance from the wall so that connection to a wall plug would be long and unsightly. Being installed in the floor, however, special outlet boxes and receptacles are required, so that water and dirt will be kept out. Fig. 9 is a sectional view of a Fullman adjustable watertight floor-outlet receptacle and attachment plug. When not in use only a flat plate shows, flush with the

Fig. 12.—Non-Adjustable Floor Box.

floor level, while when the attachment is made the bell nozzle shown on the cord is screwed in place entirely sealing the box. Fig. 12 is the Fullman 3.5-inch non-adjustable type of floor outlet box and receptacle. Fig. 13 shows a VV waterproof receptacle and lamp guard.

For signs another line of receptacles have been developed. For outline work or where the back of a sign is entirely open, receptacles are used which can be installed so that the wiring and connections are made on the back. These are called pig-tail receptacles. The wires are tapped onto the feed wires which may be run on knobs, placed short distances apart. Holes are bored in the sign in which the

Fig. 13.—Waterproofing Fitting.

receptacles are located and held in place by screws.

For all sign work or where joints or splices are made in places subject to weather, moisture and the like, as-

phaltum paint generously applied over the rubber and friction tape will make them more secure.

For enclosed signs, such as are hung in front of buildings, mounted on roofs or installed in other similar places, special receptacles adapted for the purpose are on the market. These receptacles and sign wiring are described later.

Vacuum Cleaner and Runabout.

Our National runabout, equipped with 30-coil lead battery and carrying a 50-volt vacuum cleaner of the portable variety, is the best paying proposition in our business. A boy, two No. 6 flexible conductors, and the cleaner are in demand at 75 cents per hour. The motor requires one-eighth horse power; charging current costs four cents per kilowatt-hour. It gets the business because it does not use the customer's twelve-cent current, and because our man is on the job.

G. W. Barlow.

Fire Caused by Electric Cutter.

An electric cutter, used to cut napped cotton blanketing into blanket lengths before finishing, was tapped into a 120-volt direct-current trolley feeder. On starting the cutter motor, a good-sized spark was produced, starting a fire in the large quantities of fly near. The fire flashed over the napped goods on the cutting table and spread to the contents of twelve adjacent trucks.

Electric motors for cutters should be inclosed, or induction motors should be used. The napping machines in this mill have been equipped with an exhaust system for collecting the fly.—*Insurance Engineering.*

Squirrels Destroy Insulation.

Trouble with the electric lights at Krug Park in Saint Joseph, Mo., has been traced to the gnawing propensities of the squirrels. The electric-light wires were brought into the building through a cage built for winter quarters for the squirrels. It was found that one of the squirrels had eaten all the insulation off the wires, with the result that grounds and short-circuits were frequent.

The City of Melbourne, Australia, possesses one of the most complete systems of suburban railroads in the world and a project is now on foot to electrify them. A controversy has taken place in regard to the kind of system to be adopted. Consequently the Government is obtaining bids for equipping the lines by alternating and direct current. The result of these bids will probably determine which system is to be employed, as the bids must be accompanied by guarantees.

Herman Andrae.

Herman Andrae, electrical contractor, of Milwaukee, was born in that city in 1860. He is the eldest son of Julius Andrae, president of Julius Andrae & Sons Company, one of the largest electrical supply houses in Wisconsin. In 1880 Herman Andrae became an assistant to his father in the business of installing electric bells and speaking tubes, and in doing locksmith work. After a short time, however, he went East for the purpose of acquiring greater skill in the electric-bell business, and while away worked in New York, Philadelphia and Boston. Returning to Milwaukee, Mr. Andrae again associated himself with his father in business, and after a short time they added electric light and power wiring and the installation of motors to their former lines of work. Finally they also took up the installation of

Herman Andrae.

complete isolated electric lighting plants.

In 1905 Mr. Andrae bought out the contracting department of Julius Andrae and Sons Company and incorporated under the name of the Herman Andrae Electrical Company, which concern devotes its entire energies to electrical contracting. The officers are: Herman Andrae, president; J. Tellier, vice-president; and J. A. Piepkorn, secretary. The company employs from forty to sixty men the year round. They have completed important electrical installations in fifteen or twenty different states within the last few years, having installed the electrical equipment in thirty large post-office buildings, located in a dozen different states, during this period. Among the largest electrical installations which the company has lately put in are that of the Naval Training Station, at North Chicago; the Post-Office and Custom House Building, at Toledo, Ohio; and that of the Milwaukee Auditorium Building, Milwaukee, Wis.

Among the Contractors.

Henry Newgard & Company, electrical contractors and engineers, whose headquarters are at 947 Washington Boulevard, Chicago, will establish branch offices and shops in Milwaukee. The necessary rooms have been secured at 276 West Water Street in that city, where business will be regularly begun within a few weeks. This company is now engaged in installing the electrical work in the addition to the Boston Store in Milaukee. Besides the interior wiring for lights, elevators and other appliances, this job includes the installation of twelve five-light tungsten standards. The total cost of the work will be approximately $20,000.

The Electrical Construction and Machinery Company, of Rock Island, Ill., of which J. T. Marron is the president, has just finished an important job of electrical work for the Rock Island Plow Company. The work included the installation of 270 three-phase induction motors, the aggregate horsepower of which is 3,300. There were also installed in the plant in question about 4,000 incandescent lamps, consisting mainly of tungsten series clusters. Mr. Marron's company is also engaged in an electrical installation for John Volk & Company, of Rock Island. This latter concern operates a sash and blind factory, in which individual motor drive is being substituted for line-shaft operation.

The Broderick Bolte Electric Company, of East St. Louis, Ill., reports the recent securing of a number of attractive contracts. Mr. Bolte states that the indications are that the coming spring will be an unusually prosperous one along electrical lines in his section.

The Central Electric Company, of Peoria, Ill., is putting in an isolated lighting and power plant for the Bradley Polytechnic Institute, in Peoria. The plant will be located in its own building and underground distribution will be employed to the buildings to be served.

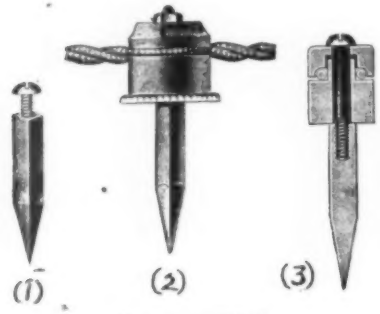
E. E. Gibson, of Decatur, Ill., states that the contracting business in his city has been rather seriously hampered by the recent cold weather, but that prospects for business in the spring are good. Mr. Gibson, ho is president of the Associated Electrical Contractors of the State of Illinois, conducts an electrical merchandising business in connection with electrical contracting.

John R. Galloway, one of the prominent electrical contractors of Washington, D. C., announces that his office has been removed to 813 H Street, N. W.

HINTS FROM GERMAN WIRING PRACTICE.

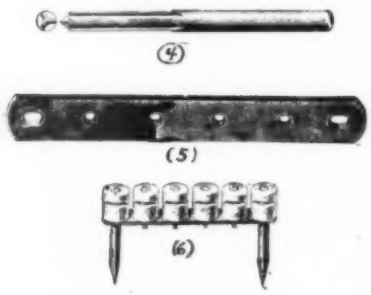
By Albert Scheible.

The presence on the American market of steel drive pins or dowels for use on solid walls shows that some of our contractors are patterning after European wiring practice. Whether they will want to follow the latter in very many respects is another question, but some of the methods of German wiremen should certainly be both interesting and suggestive to American readers. Particularly should this be true of the means used for fastening insulators, conduits, etc., to walls on which wood screws will not hold, as the problem of making such fastenings has been much more common in Germany owing to the more general use of solid stone and concrete as building materials.



Figs. 1, 2 and 3.

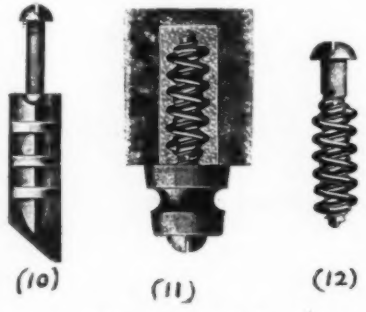
There, as here, the original practice of driving a wood plug into a hole in the wall and using a wood srew in this plug, has long ago been abandoned owing to the impossibility of obtaining a permanently firm fastening in this way. The most popular substitute has been the steel drive dowel (Fig. 1), which is now marketed also in the United States and which is usually threaded to fit a machine screw. Sometimes this is driven into a slightly smaller hole so as to give a driving fit, but more often the hole is bored considerably larger than the dowel, the latter being cemented in place with concrete or plaster of paris. Single-piece porcelain knobs are often made with interior threads, enabling them to be screwed direct to the projecting threaded shank of the dowel without using a separate screw.



Figs. 4, 5 and 6.

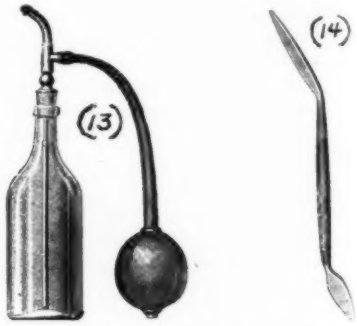
For two-piece insulators, a separate screw is used as in Fig. 3, or the dowel itself may be threaded to take a nut as in Fig. 2. The latter cut also shows an ornamental brass rosette used under th porcelain knob. Where a group of parallel wires are to be run, the knobs are bolted to a galvanized iron strip which is screwed to a pair of such dowel pins (Fig. 6). These strips are regularly sold in different lengths, the end holes being elongated to allow for some irregularity in the spacing of the supporting dowels. (Fig. 5.) For pipes and conduits, two-piece clamps are screwed to the dowels as shown in Fig. 7, which also shows the corrugated pin preferred by some. For boring the holes for these dowels, the makers recommend the use of three-lipped drills (Fig. 4).

Figs. 7, 8 and 9.



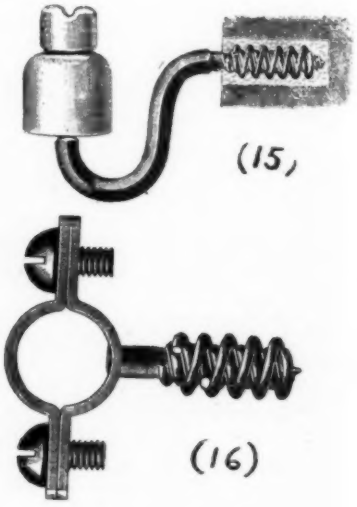
Figs. 10, 11 and 12.

Expansion bolts as we know them in dozens of types have not appealed to the Germans, probably for the reason that the spreading of a shell or sleeve to give a bearing along several lines does not comply with the European idea of real stability. Such bolts can usually be shaken slightly in some direction and while this may not interfere at all with their serving the intended purpose, it does not accord with the ideas of those to whom even our familiar hollow tiling seems too frail for general use. Hence, instead of boring a hole and expanding an anchoring sleeve against its sides, the continental European cements the nut or anchor-piece into the hole. Sometimes the anchor-piece is of lead, or even of wood (Figs. 10 and 7), but more often it is a spiral of wire. Single spirals of brass wire are popular for this purpose, but the type made with two connected spirals within one another gives more of a grip on the cement or plaster (Figs. 11 and 12).



Figs. 13 and 14.

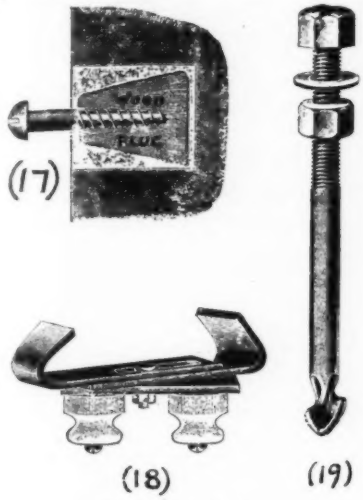
To insure a proper union between the cement and the wall, the inside of the hole is moistened by a spray from an atomizer (Fig. 13). Then a small spatula (Fig. 14) is used to daub the soft concrete or plaster of paris on the spiral and into the hole. Of course the spiral is inserted when already expanded on the screw and the latter can be withdrawn after the plaster has



Figs. 15 and 16.

hardened. For outdoor wall brackets, bent screws like Fig. 15 are used with such fastenings, while Fig. 16 shows an allied form for supporting conduits.

Some contractors dodge even the spiral expansion fastenings, preferring to imbed shanks with twisted ends like the bolts commonly used for supporting switchboards (Fig. 19). For



Figs. 18 and 19.

steel beams, porcelain knobs are bolted to clamps (Fig. 20) which grip the flanges of the beam and which may be swiveled as in Fig. 20 if the knobs are not to line up transversely to the beam. The clamp used for fastening

Fig. 22.—Wireman's Ladder.

insulators to gas pipes is shown in Fig. 9.

In boring the holes for the spiral fastenings, tubular drills are most generally used and are sometimes made of high-grade (Krupp) steel. However, triangular and cross-shaped types of drills are available for work in hard stones or on concrete which has firmly set. In either case, the holes are not bored by using a brace or breast drill, but by persistent hammering on the stub end of the drill which is steadily rotated and occasionally withdrawn to prevent clogging of the hole.

Of course, the holes needed for imbedding the fastenings are much larger in diameter than those required for the types of expansion bolts common in this country and the time required for making the fastenings is much greater. The Germans (as well as the Austrians, French and Swiss who all follow much the same practice) justify the extra time by the greater stability thus obtained. The same eagerness for safety which prompts the German wiremen to spend so much extra time in imbedding these wall fastenings also shows itself in the ladders which they use. Thus, the folding ladder in Fig. 22 has a footpiece which prevents it from tipping sidewise—a simple but effective precaution. Likewise, the brackets used on the separated ladders in Fig. 23 make a firm support for a plank on which the wireman can walk back and forth while stringing wires along a ceiling.

Electrification of a Phosphate Island.

It is estimated that Makatea, one of the Society Islands, about 120 miles northeast of Tahiti, contains 10,000,000 tons of high-grade phosphate, averaging eighty-two per cent, with many million tons more of inferior quality. In order to facilitate getting out this phosphate the company engaged in the work had its engineer install an electric plant of 240 horsepower for lighting the island, for propelling the cars carrying phosphate, and also to run the crushing and drying plant now under construction. When this undertaking is completed, about February, 1912, fifteen tons can be turned out per hour.

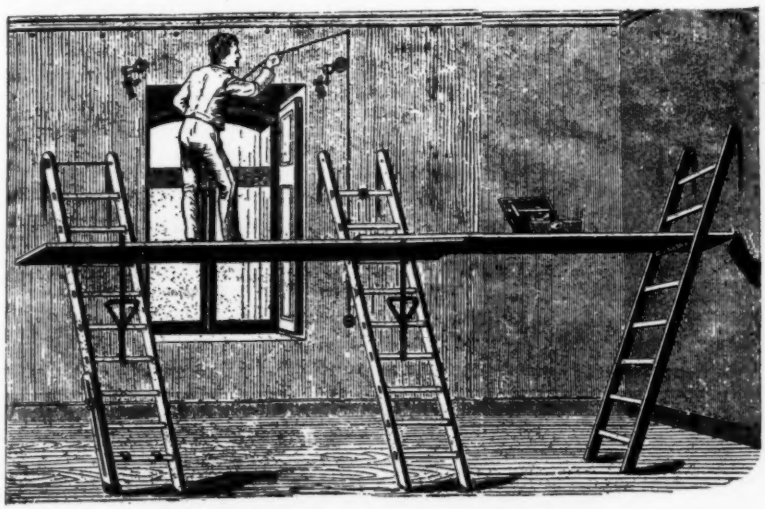
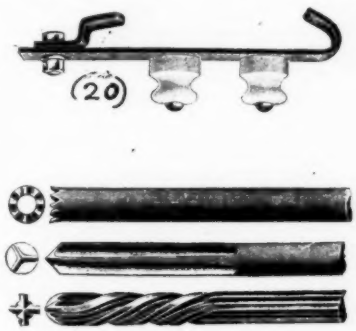


Fig. 23.—Wireman's Ladder-Scaffold.

HOW AN ELECTRIC FLATIRON CAMPAIGN WAS SUCCESSFULLY CARRIED OUT.

By George W. Craighead.

A successful campaign of any article that consumes electrical energy is always worthy of the notice of the central station. If electrical contractors, however, would make a special effort to place current-consuming devices with the public, central stations would not be doing many of the things which



Figs. 20 and 21.

are now being done by them in various localities.

A campaign that will be successful requires a certain amount of planning, backed by capital. The following is a plan of campaign for the introduction of electric flatirons that was successful.

It was first necessary to thoroughly investigate and test several first-class electric irons, and to decide which was best suited for the purpose, quality and price being considered. The iron decided upon was thoroughly examined in every detail, and several good talk-

ing points in its favor were brought out.

The next thing to decide was the proper time to launch a campaign of this kind, and it was decided to start the first of June. The start was made with newspaper advertising, with fair-sized advertising showing an illustration of the iron, and giving the talking points. This advertising lasted about thirty days, and on July 1, ten solicitors were employed.

The work these solicitors were to do was definitely outlined for them, and they received instructions several times before actually entering the field. They were instructed, first with respect to the section of the city they were to work in, and were required to make a house-to-house canvas regardless of whether houses were wired or not. On entering the house it was the solicitor's duty to make the proper memorandum of street and house number, owner's or tenant's name, checking the various items as shown on the card illustrated herewith. After filling in the heading of the card, the solicitor would ask if the house were wired. Where the answer was "No," a record was made on the card to this effect, and the solicitor passed on to the next house. Where the answer was "Yes," it was also recorded and the people were asked if they used an electric iron. If they replied that they did, if it were possible information was obtained as to what make it was, how long it had been in use, and whether it was satisfactory. The solicitor would then try to interest the people in other various current-consuming devices and make a careful report on this card. If the party interviewed did not have an iron, it was the solicitor's duty to get permission to install an iron for a free trial of two weeks. This free trial carried no obligation whatever, and in almost every case the solicitor was able to place an iron on trial. In this manner he proceeded from house to house. Each evening all solicitors would come in from various parts of the city and hold a meeting, at which time their reports were compared, and general discussions entered into. There was, of course, quite a bit of rivalry among them as to who would have the best day. It probably averaged placing ten irons a day apiece. In deciding which had made the best record for the day, results were obtained by taking the percentage of the solicitor's possible chances with the ones he made good on; if a man had five opportunities to place an iron and placed five, his percentage would be one hundred, and he would be placed ahead of a man who had placed ten out of fifteen chances. This made the solicitors very anxious not to lose the least opportunity and probably added quite a bit to their efficiency.

NO. _____ ST.

OWNER'S NAME _____

TENANT'S NAME _____

Wired	Iron	Sewing Machine Motor	Warming Pad	Curling Iron	Percolator	Toaster	Mazda Lamps	Vacuum Cleaner	Chafing Dish

REMARKS:

Fig. 1.—Memorandum Card.

Certificate No. 882 *Date*_____ *191*__

This is to Certify, *That I have received from* ***Craighead Plumbing and Electric Co.,*** one **Iron,** *No.*_____, *for trial only, and will return same to them when called for.*

*Signed*_____

_____ *Street.*

Fig. 2.—Receipt Card.

$ _____ *Richmond, Ind.,* _____ *1910.*

_____ *after date* _____ *promise to pay to the order of*

Craighead Plumbing and Electric Co.

_____ *DOLLARS,*

at the Union National Bank of Richmond, Indiana. Value received, without any relief from valuation or appraisement laws, with interest at the rate of _____ *per cent. per annum after maturity, and attorney's fees.*

The drawers and endorsers severally waive presentment for payment, protest and notice of protest, and non-payment of this note.

This note is subject to the approval of the Craighead Plumbing and Electric Co. and contains all the agreements pertaining to the sale of the article hereinafter mentioned, and is not negotiable by endorsement or otherwise by any agent.

This note is given for the purchase of the article mentioned below, the conditions of which purchase are that the said article of personal property shall remain the property of the Craighead Plumbing and Electric Co. until this note and the indebtedness evidenced thereby are fully paid, and that upon default of payment of the said indebtedness as hereinafter stipulated or at any time after such default before payments have been made in full, or in case said instrument before payment in full, is removed from my present residence without the written consent of the Craighead Plumbing and Electric Co., then the said Craighead Plumbing and Electric Co. shall have the right to take possession of the said article of personal property hereinafter described without liability upon its part to refund any money previously paid on account of said purchase—all of which payments so made, and all of which payments shall be forfeited to the said Craighead Plumbing and Electric Co. in payment for the use and possession of the said personal property to the date of such default.

I promise to pay the sum of $ _____ *at the store of* ***Craighead Plumbing and Electric Co.***

for _____, *Number* _____, *at the rate of* $ _____

each two weeks until the said indebtedness is fully paid according to the terms of this contract.

Fig. 3.—Form of Note for Monthly Payments.

After the solicitors' daily cards had been assorted, a list was made of the parties that were to have a trial installation. These lists were made up, and a special man delivered the irons. Upon delivery of the iron to the prospective customer each was asked to sign a receipt card which showed the date and the iron number. At this time a record was also made in a specially prepared book. This showed which solicitor had placed the iron, the receipt number, prospect's name and address and iron number. The receipt cards were then filed two weeks ahead, at which time they were turned over to a collector, and he collected the iron or the money. In cases where people would not have the money ready he carried a legal form of note which they might either sign for cash payment or on a monthly basis. The signing of this note by the prospect was an insurance against bad accounts as the company was in a position to collect the note or the property at the time specified. The note is illustrated herewith.

Daily advertising was kept up to assist the solicitors, and telephone calls for free trials were very numerous. This campaign lasted for thirty days and was successful both from the fact that a large number of irons were placed in use as well as being profitable financially. In addition to this an accurate card index of existing conditions was secured and a good follow-up system obtained.

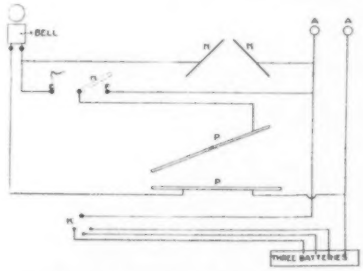
Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Shop Testing.

The accompanying figure shows a convenient arrangement of circuits for making many of the tests which the electrical contractor is so often called upon to carry on in his shop. In the diagram A A are binding-posts; N N are two brass strips about eight inches long, with right-angle flanges; M is the lever of a two-point bell switch; P P are two flat brass strips; and K is a three-point bell switch.

To test a dry cell, put lever M on point E, and hold the binding-posts of the cell on the strips P P, one binding post on each strip; if the cell is good, the bell shown in the figure will ring. When it is desired to test a plug or a cartridge fuse, push it in between the V-shaped right-angle



Electrician's-Shop Testing Circuit.

brass strips N N; the ringing of the bell shows that the fuse is intact. To test a bell, place the lever M on F and put the bell on the terminals P P. From the binding-posts A A wires may be run to work benches or other places where current from the batteries may be desired.

James B. Wilson.

Convenient Way to Catch Fish Chain.

On the end of the customary brass fish-chain place about six inches of small iron chain, and after dropping same down between walls the iron chain can be readily picked up with a bar magnet. The magnet I use was made of one leg of an old magneto horseshoe magnet, sawed off and fastened onto a piece of No. 10 copper wire about three feet long. By filing a notch around it at one end and wrapping and soldering the wire in this, a very convenient tool is made. I find this appliance especially useful in fishing around corners and in other places where a hook will not pick up a chain or a fish-tape readily.

A. C. Cameron.

Grouping Transformers on Three-Phase Circuits.

On three-phase electric circuits which must supply service to lights and also to three-phase motors, the grouping of transformers indicated in the accompanying figure is sometimes very convenient. It will be noted that the low-voltage windings of the trans-

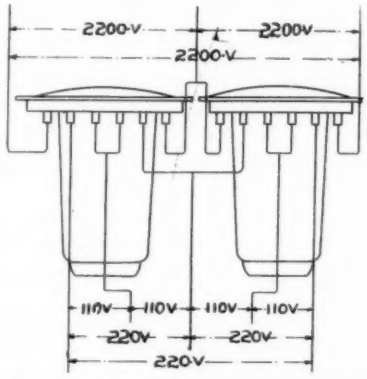


Diagram of Transformer Connections.

formers are connected in series, and that the transformers are connected to the line in the usual way. Additional wires are run from the low-potential side, however, so as to supply voltages only half that furnished for three-phase apparatus in the secondary circuits. I have some transformers connected in this way, and find that the scheme is very satisfactory.

H. J. Bluhm.

Locating Short-Circuits in Lighting Fixtures.

In the issue of January 13, there appeared a "Wiring Kink" in which Fred A. Jerram undertook to explain an easy method of locating short-circuits and grounds. I do not consider Mr. Jerram's method at all practicable; for when a 32-candlepower lamp is inserted in the fuse receptacle in one side of the circuit and the other side fused, as he suggests, anything like a complete short-circuit in a given fixture will prevent the lamps in the remaining fixtures from burning at all. My way of going about a job of this kind is to disconnect one fixture at a time on the faulty circuit, after having placed a lamp in one of the fuse receptacles, and to note the effect. As soon as the fixture in which the short-circuit or ground exists is disconnected, the remaining lamps will usually burn with a dull red glow, as will also the lamp in the cutout. The explanation is, of course, that taking the defective fixture out of circuit leaves the rest of the lamps in a sort of multiple-series relation with the lamp in the cutout, and they therefore get very little current per lamp.

W. C. Lockwood.

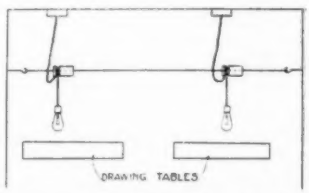
Emergency Control of Lamps.

A recent customer of ours wanted his wiring done so that in case of burglary or other emergency various lights in the residence could be all turned on from a given bedroom. We accomplished the desired object by wiring each outlet on a three-way switch and installing a three-way switch in the bedroom from which it was desired to control the lamps. To get the proper control we wired all three-way switches on one pair of dead lines, connecting the switches in multiple and terminating in the one switch in the bedroom. One live side of the line we ran to each outlet and the other to the bedroom switch. The switch-leg side was run from each cutlet and terminated in the switch controlling the outlets.

J. Howard Bothwell.

Arrangement for Shifting Position of Pendent Lamps.

Drafting rooms which depend upon incandenscent lights for illumination usually present a tangled appearance, since each man generally



Arrangement for Keeping Lamps in Place.

twists and ties the lamp cord to suit his own particular needs, which may vary five or six times a day. Such a procedure is objectionable of course. In a drafting room which I recently visited there was an arrangement for shifting the drop lights which struck me as being of sufficient interest to warrant a word by way of description of it. Porcelain knobs were strung on steel wires stretched tightly across the room and attached to the apposite walls by means of hooks. The cord of each drop lamp was secured to one of these knobs. When a draughtsman wished to move his light to one side or the other, the desired object was attained by slipping the knob along the steel wire.

H. G. Wilson.

Among the Supply Men

The Point of View.

Every once in a while some one starts out to trounce the "middleman," or jobber, visiting upon his head all the iniquities that industry and flesh fall heir to. Recently, however, there have arisen champions in the defense of the jobber and the following extracts will be found of interest as presenting the point of view from the other side.

An editorial in a recent issue of the New York Sun says:

The Middleman.

The "high cost of living," variously ascribed to the tariff, to "trusts," to the railroads, is also being laid at the door of the middleman, and especially here in New York does it appear fashionable to condemn the shipper, the commission merchant and the jobber as parasitic intruders between producer and consumer. Very recently, as an indication of the vagaries of popular opinion, a Judge, having sentenced several live poultry commission merchants to jail for "combining in restraint of trade," delivered himself of this observation:

"Between the farm and the table a chicken has six separate profits fastened on it. Six separate profits must be paid when a chicken is bought over the retailer's counter. Is it any wonder that the poor are getting poorer?"

* * *

The old fallacy that agriculture and manufacture were the only "productive" departments of human industry has long since joined the junk heap of discarded economic theories. Man is never a "producer" in the old sense. The actual transformation is accomplished entirely by the forces of nature. It is a man's job to see that the raw material and nature's forces come in contact and that the transformed product reaches those for whom it was transformed. The only economy for which man is responsible is the economy of place. In the modern sense, however, the production of no commodity can be complete until that commodity has reached the hands of the ultimate consumer, and every human being who helps it toward its goal, who creates an economy of place, is in a broad sense truly a producer—the shipper, the railroad official, the commission merchant, the jobber, the retailer just as much as the farmer, manufacturer and miner.

What arrogance then on the part of any one stratum of workers supporting the industrial edifice to usurp the name of producer and to point to others as parasites, meddlers! It is possible, of course, to eliminate temporarily the shipper, the commission merchant and the jobber from some particular commercial field, but it is impossible to do away with the need for the services which they perform for society much better than substitutes. The farmer who himself sees to the shipping of his produce must ship it in comparatively small units, pay higher freight rates in consequence, and spend valuable time away from his farm. If he co-operates with the other farmers of his region and they ship their produce in bulk, then the association to which he belongs must employ a collector and shipper, an office force to keep the books, etc., and must rent or build a warehouse or elevator; in other words, take over the entire business of the private shipper and attempt to run it as economically on a communistic basis as it was run before on a basis of profit and loss, an attempt that almost invariably fails.

Again, the farmer in Iowa, for instance, cannot attend to his crops in Iowa and at the same time look after his market in Chicago or New York. If the commission merchant who has acted heretofore as his broker in the city is to be eliminated, a substitute must be provided. An association of farmers which had installed a salaried shipper at home could be expected to establish an agency in the city, probably to co-operate with other farmers' associations in establishing such an agency to handle their produce at the market end. Here too they would be under the necessity of paying in salaries and rent what had before gone in commissions, and probably much more, since the adjustment of produce market prices from hour to hour is the result of very lively trading, and servants are never as zealous in their master's interests as when their efforts bring them a direct profit.

* * *

The elimination of middlemen requires an intricate organization combining layers of industry which do not fuse, and it can be made to pay, we venture to assert, only when engineered autocratically by such a business genius or "trust magnate," if you will, as we have not yet heard from.

* * *

Other agricultural associations have chased the same rainbow in the course of this city's commercial expansion, but never have they come to the pot of gold. The farmer can raise more vegetables and live stock, and better vegetables and live stock, and he can raise them more economically, if he lets some one else market them. Specialization has brought into being the shipper, the commission merchant, the jobber, the retailer, and with them has come cheaper and better food. The search for the cause of the "high cost of living" must be resumed.

Incidentally, under date of January 25, a prominent Chicago jobber writes us as follows:

"It is about time that the attack on the middleman or jobber is restricted to those who have laid themselves open to censure so that those who have not offended will not be tainted or misjudged.

"Many newspaper serio-comics are doing their best to generally or specifically discredit the middlemen in spite of the proven need for their services in the most important lines of business, and also regardless of the fact that they are high up among the financial and commercial factors.

"In the electrical supply business the jobbing house is an undeniable necessity. Unless there is assembled in jobbers' warehouses the thousands of items made by almost as many factories and without these warehouses, from which may be shipped complete miscellaneous orders, including all of the material required for electrical installation, the cost to the consumer for electrical material and equipment will be increased to a very great extent.

"Eliminate the jobber from the electrical, or almost any other business—instead of the middleman's profit, which the newspapers are condemning so generally, and without qualification, there would have to be paid to each

manufacturer a greater profit to cover expense of selling and distributing goods. This expense the jobber now assumes. There would also be the additional expense attendant upon ordering many items from many points, transportation, cartage, delays, the difficulty of returning goods for exchange or credit—all of these, and a multitude more, would each carry their percentage of cost.

"So far as building trades and electrical jobbers are concerned every word or act suggesting the elimination of the legitimate middleman is ridiculous, and the inspiration therefor based either on ignorance or self interest, and is discreditable to the source that inspires or utters them.

"Newspapers should be concerned as to whether their criticisms are necessary or wise. They should be particularly careful not to take with one hand the advertising consideration of the middleman and with the other to extend an unwarranted injury.

"Perhaps the middlemen for the distribution of some goods are unnecessary. There are a lot of other unnecessary things in this world, but it is certainly not sensible or equitable to criticize or condemn all existing things because we are pin-pricked at times by a few unnecessary or unsatisfactory ones. Remove the middleman from Chicago, or any other city, and a financial and commercial vacuum will be created that will be most expensive and disastrous, not only to certain classes, but to the community at large."

All Set for the Jobbers' Convention Next Week.

Arrangements are complete for the convention of the Electrical Supply Jobbers' Association at Cleveland, Ohio, February 13, 14 and 15. The various committees report everything set for an occasion long to be remembered. A special train will leave Chicago on the evening of February 12. Reservations can be made through Secretary Overbagh.

Supply Men and Their Interests.

The Oklahoma Modern Electrical Supply Company has been incorporated at Canadian, Oklahoma. The capital stock is $25,000, and the incorporators are Fain G. Gillock, W. E. Crowder, E. C. Brice, W. R. Alexander and H. N. Ames. At Lawton, Oklahoma, the Independent Electrical Supply Company has been incorporated with a capital stock of $1,000. The incorporators are Fred B. Cowell, B. B. Rhinefort and J. S. Rhinefort.

D. C. Overbagh, of the M. B. Austin Company, Chicago, son of Franklin Overbaugh, general secretary of the Electrical Supply Jobbers' Association, won a round trip ticket to the Denver convention of the National Electrical Contractors' Association at the meeting of the Illinois Electrical Contractors' Association last week. Mr. Overbagh held the lucky number drawn from a competing field of fifty men.

Public Service Commissions

OKLAHOMA.

The Oklahoma Corporation Commission has approved the application of C. Boarman, owner of the Tecumseh Telephone Company, to raise rates. Boarman showed that his system was so badly run down that efficient service could not be given at the old rates.

The jurisdiction of the Commission to control street-railway companies operating under municipal franchises is attacked by the Oklahoma Railway Company of Oklahoma City in its appeal from the order of the Commission regulating the transfer system. It alleges that the franchise constitutes a contract between the company and the municipality and that the municipality is in control.

The Oklahoma Supreme Court has granted a second rehearing to the Pioneer Telephone Company in its appeal from the order of the Commission requiring it to make physical connections with the Grant County Rural Telephone Company at Pond Creek.

OHIO.

The New Concord Telephone Company has petitioned the Ohio Public Service Commission for authority to increase its rates. The present rates are $12 for a business connection and $9 for residence service. The proposd rates are $18 and $15 respectively. A decision of this case will probably involve a determination of a reasonable rate of return on the investment and may set an important precedent, since no case of this kind has heretofore come up.

NEW JERSEY.

The Board of Public Utility Commissioners, by an order which became effective January 1, 1912, required electric railway companies to report accidents occurring upon their lines. These accident reports for the month of January, which have been tabulated, show that during this period thirty-six people have been injured and four killed.

The complaint of the Board of Education of Island Heights against the Island Heights Water, Power, Gas Sewer Company was heard on January 23. It was shown that rules of the company require advance payment and that if bills are not paid by a certain date, five per cent is added to the same. The Board decided that, being a public body and its expenditures of public moneys being subject to State law, the company should not make any addition to its bills because of failure to make advance payment.

MASSACHUSETTS.

The close relation of demand indicators to systems of charging for electrical service lends special interest to an investigation which has recently been concluded by the Board of Gas and Electric Light Commissioners of Massachusetts concerning the expediency of regulating or prohibiting the use of such instruments. Acting upon a resolution of a recent Legislature, the Board conducted a number of hearings last fall at which users and other parties interested in demand indicators appeared and discussed at some length the pros and cons of the subject. The occasion gave full opportunity for the registration of objections to these instruments, and as might have been expected, brought out some objections to the use of differential rates. It was claimed by various parties that the accuracy of the Wright demand indicator in particular ought to be ascertained, and consequently the Commission retained F. A. Laws, of the Massachusetts Institute of Technology, to conduct a test. The results of this test and the Board's conclusions regarding the use of demand indicators are of considerable interest.

The tests made by request of the Commission showed that the Wright

demand indicator, the most common type in use in the Board's jurisdiction, is a reasonably accurate device, and that relatively few grounds exist for complaint of bills so far as they may be based upon its verity. Eighty-one instruments were tested, the capacities varying from 5 to 300 amperes, the equipments being selected at random and compared with standards in the Institute laboratories. Considering an instrument correct if its accuracy was within five per cent of the true reading, the results showed that at 43 per cent of the indicator rating, 58 of the 81 were correct; 15 registered too high and 8 too low; and at 90 per cent of the instrument rating, 66 of the 81 were correct, 11 were too high and 4 too low. The details as set forth in the report of Professor Laws indicate that there is a genuine need for regular calibration of such instruments, and it is of significance that those used by the Boston company, the largest in the State, are passed through the laboratory in a systematic manner and on a time basis. Something over 4,000 instruments of this class were tested and calibrated by the company last year, and the system of routine inspection provides that 25 per cent of the number in use shall be returned each year for verification. It appears that a wider application of the plan of testing and calibration, whether in a routine manner or as a result of complaints, would still further reduce the objections which have been raised in a somewhat limited way to the use of such instruments, and the Commission proposes that it powers to be increased to enable it to have jurisdiction over demand indicators as in the case of gas and electric recording meters. In this way, the consumer doubting the accuracy of the device has recourse to a test under the auspices of the State, and little hardship if any is imposed upon the operating companies.

It is significant of the rate-making situation generally that the Commission believes that "the available experience is not yet sufficient for reaching any just or final conclusion as to the expediency of prohibiting or restricting differential rates." The Board says that "after carefully noting the various schedules of rates of the companies under its supervision and their effect upon revenues, output and operating efficiency, two things are evident, namely, that the men engaged in the business seem agreed upon the present necessity for differential rates, and yet there is no general agreement among them as to the theory or practice upon which such differential rates should be based. The use of demand indicators is so intimately involved in the problem that for like reasons it seems at present inexpedient to prohibit or restrict their use. On the other hand the Board is emphatically of the opinion that it is not in the public interest that any legislative sanction or approval, directly or indirectly, shall be given to differential rates."

The report contains a hint that a larger agreement among producers of electricity as to the whys and wherefors of rate-making will be a decided benefit to the industry.

NEW YORK.

The Public Service Commission has approved the mortgages proposed by the Third Avenue Railway Company to secure the bonds proposed for issuance under the plan of reorganization already approved by the Public Service Commission under the decision of the Court of Appeals. The first mortgage is to the Central Trust Company for $40,000,000, dated December 20, 1911, and the second is an adjustment income mortgage to the United States Mortgage & Trust Company for $22,536,000.

Formal approval has been given to the reorganization plan of the Metropolitan Street Railway Company. In issuing the order the Commission stated that it did so in conformity with the decision of the Court of Appeals, in the Third Avenue Railroad case, which held that the Commission could not withhold its consent to a reorganization plan, because the value of the mortgaged property and the new capital to be invested were less than the amount of securities to be issued, provided the new securities were not greater in value than the old.

The commission consequently authorized the New York Railways Company, which has taken the place of the old Metropolitan, to issue $17,500,000 par value of stock, $16,768,100 thirty-year refunding four-per-cent gold bonds, and $31,933,400 thirty-year adjustment five-per-cent income gold bonds.

The Public Service Commission, Second District, has notified the New York Central and Hudson River Railroad Company and the New York, New Haven and Hartford Railroad Company that the proof submitted by these companies on applications asking that the New York Central be allowed to purchase the majority stock of the New York, Ontario & Western Railroad Company and the New Haven to purchase the stock of the Rutland Railroad Company, is not sufficient and satisfactory to the Commission, and that upon its own motion a further hearing has been called to the end that the applicants may prepare to give further proof as to those matters concerning which the Commission desires further enlightenment. To cover the questions and to give the Commission full command of all the circumstances and conditions leading up to the transactions covered by both cases, the Commission deems it essential that the individuals, both those who directed and those who took part in the negotiations, should be produced as witnesses and full disclosure be made of the reasons and purposes of the contracting parties. The Commission points out that three important matters are involved in each of these applications: (1) Protection of rights of minority stockholders; (2) control of comparatively small railroads by great systems; (3) possible elimination of competition by absorption of competing line.

It is stated that in both applications the proposed purchases are at prices above the market value of the stocks; both are of a bare majority of the stock and apparently for the purpose of control only; the business prospects of neither road whose stock is being purchased are such as to warrant the purchase as an investment; neither of the purchasing roads is in financial situation to warrant the purchase simply as an investment; and the condition of both roads whose stock is sought to be transferred is such financially that the majority of control can easily and without such violation of law as could be prevented by the courts, oppress the minority in carrying out the plans of the majority control as to its entire system.

The Commission has received an application from the village of Homer, Cortland County, asking that a proposed municipal lighting plant may have authority to engage in commercial lighting in that village. The village is now served by the Cortland County Traction Company. The village authorities state that they are at present paying $70 per lamp for street lighting and believe that under a municipal plant light can be produced at a rate of $38.40 per lamp. The consent of the Commission is not necessary for the village to provide its own street lighting, but before engaging in commercial lighting it must have the consent of the Commission.

WISCONSIN.

The Chicago and Wisconsin Valley Railroad Company has been granted a certificate of convenience and necessity and will immediately set about the construction of a line of interurban railway to connect the city of Madison, in Dane County, with the city of Portage, in Columbia County. The company intends, at some future time, to extend the line to the city of Merrill. The proposed line will serve a section of the State which is now without adequate railroad facilities.

Legal Notes

CARE REQUIRED OF ONE FURNISHING ELECTRICITY TOWARDS PERSONS RIGHTFULLY ON PREMISES SUPPLIED.

By Maguire and Mooney.

Daniel Mangan was employed in the machine shop of the Louisville & Nashville Railroad Company in the City of Louisville. The Louisville Electric Company furnished the railroad all electricity for lighting of the machine shops and the wires leading in and about the machine shops carried a current of over 2,000 volts. Mangan got on a metal stand to turn the light in the shops, a ground connection was furnished the electricity, and the subsquent electric shock killed him. The company contended that the defective ground connection was caused by a telephone line repairer in making a ground connection with the Louisville Electric Light Company lines, and inasmuch as the telephone lineman was not an employee of that company, it should not be held responsible for his acts. The court held that Mangan was in a place where his business required him to be, and where he had a right to be; and it was the duty of the electric light company to so protect and insulate its own wires that those who were in the proximity of the wires would not be injured.—Phelan vs. Louisville Electric Light Company, 91 S. W. Rep., 703.

In the case of Brooks vs. Consolidated Gas Company, 70 N. J. Law, 211, Brooks was a caretaker in the employ of one Asiel at Long Branch, N. J., Brooks, with his family, was living in the stable on the premises. His duties required him to watch for and repair leaks in the roof of the house. One day, accompanied by his son, he went upon a balcony extending over a part of the first story of the house and accessible only from the house. The balcony had a tin floor and was surrounded by a railing four feet in height. Brooks was painting the gutter and in leaning over the railing he grasped a wire and was killed. The wire had worn away its insulation at this point. At Mr. Asiel's request, the current had been shut off from the house, but the wire that Brooks seized was live. In placing the wires near the balcony the company should have foreseen the possibility, and the probability, of some one using the balcony for pleasure or for other purposes, and the company owed a duty to everyone who might lawfully come upon that balcony to exercise such care as the circumstances required.

When persons are shocked from circuits in localities where they have a right to be, a cause of actions lies against the company maintaining the wires. The company should see that the wires are insulated or so placed that contact is not possible. But when the injured person is aware of the danger of contact, or has been warned, and deliberately touches a conductor, the company is not responsible.

S. A. Clonts was employed by the Laclede Gas Light Company in removing debris from one floor of the company's Station A to another floor. He would load a wheelbarrow with the debris and transfer it from floor to floor by means of an electric elevator owned by the company. This elevator was operated by means of a tiller rope—an uninsulated steel cable passing through the elevator and around the sheave wheel in the bottom of the shaft to the drum, above. In order to move the elevator, Clonts had to grasp this steel cable with sufficient force to turn on the power. The elevator was propelled by an electric motor which employed a direct current of 500 volts. Though this power was generated on the premises, the cable carrying it came into the building from the outside. Clonts got into the elevator with a load of debris and grasped the steel cable in order to move the elevator, when a shock of electricity was communicated from the uninsulated steel cable sufficient to cause his death. The evidence in the case shows that the shock received by Clonts was caused by a sudden influx of 2,500 volts, which was occasioned by the Laclede Company's wires crossing the Union Light Company's wires at a distance of over five miles from Station A. The elevator was in a defective condition for as long as a year before the accident, and the leakage of current was great that the engineer employed by the company connected a lamp with the steel cable to warn persons that there was a dangerous voltage there. But the lamp was not for that purpose, as it was designed to light only when the pressure was between 80 and 200 volts. The court held that the company was negligent in permitting a defective elevator to be operated and ordered final judgment of $5,000. Where a company fails to protect persons rightfully on its premises, even if they are its own employees, with the ordinary means of insulated and proper appliances, it is always guilty of negligence. The company should have insulated this steel cable, and that precaution alone would have saved the man's life. A company has no excuse in permitting its electric current to pervade its premises through leakage. The actions and results of an electric current are so well known now that a central-station operator should confine each current to its own wire and not permit leakage from wire to wire.—Clonts vs. Laclede Gas Light Company, 140 S. W. Rep., 970.

One Arnston had been employed by a Mr. Stone to install a new furnace in Stone's residence. Stone was a customer of the Union, Light, Heat & Power Company, and his house, including the basement, was equipped with the requisite fixtures, and he was being supplied with service. The work had practically been completed, and Arnston's services were not further required. He forgot his tools when leaving and at noon the next day he went back to the basement to get the tools, and while gathering them up received an electric shock and was killed. Previous to the accident the company had been notified that the transformer which reduced the primary current of large voltage to one suitable for lighting purpose was out of order, and the company admitted that they had notice of the defect. The court held that it was the company's duty to immediately cut off the current until the defect could be remedied. The company, however, contended that they owed no duty to Arnston and therefore could not be held liable. The company did owe a duty to Stone, the owner of the house, to prevent a dangerous current of elc-

tricity from entering his dwelling. This duty, on the plainest principles of common sense, extended to his family, his servants, his employees, and all others who might rightfully be upon his premises. The company should have known that many persons would be upon the premises from time to time, and that workmen and artisans would be required to go into the basement for various purposes. The company should have known that the owner might invite whomsoever he pleased, either workman or guest. The basement of the house was a part of the house that was intended to be used and occupied just the same as the rest of the house and just as great a degree of care should be taken there as anywhere else. —Union Light, Heat & Power Company vs. Arnston, 157 Fed. Rep., 540.

A person unacquainted with wires may go out of his way to touch them and still hold the company responsible. In the case of Colusa Parrot Mining & Smelting Company vs. Monahan, 162 Fed. Rep., Monahan was directed to go up on the ore-house to do some work. In doing the work he slipped, and, in falling, caught hold of a live wire. Monahan was a common laborer, unacquainted with the electric current. The wire was about four feet above the roof, and was very poorly insulated. The court held that Monahan could recover from the company.

In manufacturing devices for the use of electricity the public is invited to use these, and they must be properly protected. The rule applies with equal force to companies exhibiting at electric shows and expositions. Even for the purposes of an attraction, it is bad policy for a company to permit even the slightest current to pass around the railing which the public is sure to touch. There are numbers of people so afraid of electricity that a mere touch or a slight shock will render them unconscious, and even if no permanent injury results, recovery can always be had for the nervous shock. This is true, whether the current comes from a small battery or a power system. The company would have no excuse whatever if an accident occurred. Wherever the public is invited they have a right to be there and they are entitled to protection while there.

Even though a company is bound to maintain good service and protect its customers and their guests by providing safe appliances, nevertheless they owe no duty to the person who touches wires and appliances he knows or should know are dangerous.

But people cannot deliberately touch wires and hold the company liable. In the case of Ergo vs. Merced Falls Gas and Electric Company, 119 Pac. Rep., 101, Ergo, 23 years old, was employed by the company at a transformer house in the course of construction. He was engaged as a plumber's helper, the plumber putting water pipes in the transformer house to connect with perforated cooling pipes on the roof. The main roof covered the entire house —the upper roof covered only part of the main roof. The cooling pipes were situated between the two roofs. At the south end of the transformer house three power wires extended from a pole into the space between the two roofs and were there fastened to three insulators on a cross-arm, and from there extended down to the transformers. The wires were in plain sight and Ergo was especially directed to keep away from all wires, the directions being given not only by the plumber but by other men working around the house. Ergo contended that inasmuch as he was unacquainted with electricity and knew little about it he should be entitled to recover damages, but he testified that he lived for years in large cities in which electricity was used and knew that it was a dangerous agency, but he forgot all this when near the wires and touched them, probably out of curiosity, and was badly injured. The court held that forgetfulness could not be charged against the Company. If Ergo could not have had sufficient recollection to remember his warnings the company would not have to pay him for it.

In the case of Williams vs. Bunker Hill and Sullivan Mining & Concentrating Company, 190 Fed. Rep., 78, Williams, an intelligent and experienced man, was an employee of the mining company. He had worked in the mine five months, and had daily ridden in and out of the mine. On all these occasions he had seen the exposed trolley wire, and could have seen that it was not guarded, insulated or protected, and that it conducted sufficient current to propel a train of cars. Williams came into contact with the trolley wire and received a severe shock. He sued on the theory that the company should have informed him of the danger. The court held that a person of sufficient maturity to appreciate the danger of handling wires charged with electricity, whose duty or business does not require him to handle electric wires, is guilty of contributory negligence in intentionally touching or handling them, and that person cannot recover.

The general rule may be thus stated: the company owes a duty to protect every person who is rightfully on the premises supplied with electric current from injury, unless that person, through his own negligence, should cause the injury.

Interesting Cases.

INTERRUPTIONS OF SERVICE BY WORKMEN.—A case has been decided in Oregon in which criminal charges were preferred against two employees of the Hydro-Electric Company by the Pacific Power & Light Company for alleged destruction of property.

The Hydro-Electric Company was erecting a new line parallel to the 2,200-volt line of the Pacific Power & Light Company. At the Indian Creek bridge it was necessary to raise the lines above those of the latter company, using poles sixty-five feet in height. The workmen found that it would be impossible to set the poles without having the guy wires come in contact with the live wires of the other company, and to prevent danger the workmen opened switches in the Pacific Company's line, cutting off current from about sixty customers of the Pacific Company and leaving them without any supply for about four hours. This act was alleged to be malicious.

Evidence was brought out by the defense to show that the lines of the Pacific Company at the point in question were not properly constructed. The charges were dismissed on the ground that the defendants acted in a reasonable and sensible manner.

MUNICIPAL PLANT ENJOINED.—A permanent injunction has been granted against the city of Longmont, Colo., restraining that municipality from proceeding with the construction of an electric light plant. The proceedings were instituted by the Northern Colorado Power Company.

The Longmont Service Company is an association of citizens formed for the purpose of erecting a plant to be later sold to the municipality. The Court ruled that the ordinance by which the city entered into a contract with the company was in effect a franchise and it was illegal because it was adopted without publication.

The work of building the distribution system is not interfered with by the order of the Court, which ruled that the bond issue for this purpose was valid. According to the decision, the city may operate its own distribution system and make any arrangement it may desire with any company or corporation for power.

METER DEPOSITS INVALID—In a case brought by a consumer against the San Francisco (Cal.) Gas & Electric Company for refusal to furnish service until a deposit was paid for the meter installation, the State District Court of Appeals has rendered a decision in favor of the plaintiff, holding that in its use of the city streets the company has not the right to demand payment for house connections.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within one week of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 38.—Wound Rotor for Induction Motor.—How is the rotor of a three-phase induction motor wound so as to have only two slip rings? I recently saw one whose speed can be regulated by changing grid resistances in series with the rotor, but it had only two slip rings, whereas I think it should require three.—D. T., Highland Park, Ill.

No. 44.—Instruments For an Exciter Circuit.—Is it considered poor practice to dispense with the voltmeter and ammeter on an exciter for an alternator in a small lighting plant? If it is necessary to keep the expense down by using only one instrument, which is it more practical to dispense with, the voltmeter or the ammeter, and why?—G. F. L., Marion, Kans.

No. 45.—Feasibility of Teaching Practical Electricity in Manual Training High Schools.—I should like to get through your questions and answers department some brief expressions from any of your readers that have had experience in teaching practical electrical work in public manual training high schools. Is it feasible to undertake this? If so, what are the conditions that produce the best results?—H. S., Galveston, Tex.

No. 46.—Combination Switch for Stairway Lights.—Is it possible to arrange the circuits and switches in a stairway so that as one goes up the stairs he may, by means of a single switch on any landing, turn off the light on the next landing below and at the same time turn on the lamp on the next landing above? If so, what is the proper arrangement of circuits?—J. S. C., Detroit, Mich.

No. 47.—Effect of Lubricating Oil on Generator Windings.—In a central station of which I am in charge, I find it difficult to keep the engineers from flooding a portion of the windings of the dynamos with oil while filling the bearings of the machines. In the case of 2,300-volt alternators, is there danger of such lubricating oil as is commonly used spoiling the insulation of the armature windings?—W. I. L., Chapel Hill, N. C.

No. 48.—Opening of Circuit-Breakers During Thunder Storms.—In our plant we were troubled greatly during thunder storms by switchboard circuit-breakers opening. Was this caused by the line wires swinging together and thus causing a short-circuit or was it an effect due to lightning?—G. K., Tulsa, Okla.

Answers.

No. 40.—Selective Parallel Operation of Door Bells.—It is desired to have three bells connected in multiple and rung together from one push-button at the front door; it is also desired to have a push-button at the side door to ring two of the bells, but not the third. A physician says he had this arrangement operating for several years, but carpenters in making some repairs destroyed the wiring; now he wishes it restored. How is it done?—C. A. W., Peterboro, N. H.

Solution 1.—By using an ordinary push-button at the front door and a three-point push-button (also called a return-call push) at the side door, this can be accomplished very nicely (see Fig. 1.). Connect one pole of the battery to one terminal of each bell; connect the other pole of the battery to the lower contact of each push-button. The tongues of both buttons are then connected to the other terminals of the

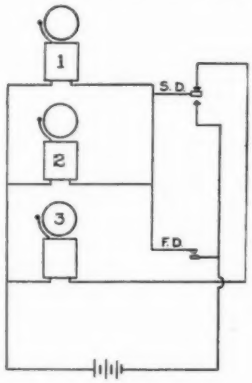


Fig. 1.

two bells desired to be operated by the side-door push. The other terminal of the third bell is then connected to the upper contact of the three-point push button. The connection between the tongue and the upper contact of the latter push normally keeps the third bell in parallel with the other two, but when operated battery current will flow from the lower contact through the tongue to the two bells only that it is desired to ring from the side door.—C. C. G., Louisville, Ky. [Similar answers from H. M. P., Milford, Ill.; H. E. W., Chicago; W. F. P., Rochester, N. Y.; F. M. J. M., Middletown, O.; R. W. E., Chillicothe, O.; W. V. S., Jersey City, N. J.; E. M. R., Saginaw, Mich.; W. C. S., Philadelphia, Pa.; E. J. R., Newark, N. J.; L. C. P., New York, N. Y.; C. T. P., San Francisco, Cal.; R. V. G., Burlington, Ia.; A. H. R., North Abington, Mass.]

Solution 2.—The method I would use in wiring these bells is shown in the accompanying diagram (Fig. 2). From this it is seen that button *A* will ring two of the bells while button *B* will ring all three of them. Button *B* is a three-point, or two-circuit, push of the open-circuit type, such as is used to extend the bell on a single indicator where an annunciator is used.—R. J. W., Cleveland, O. [Similar answers from W. W. Berger, Salisbury Center, N. Y.; H. H. H., Lawndale, O.; B. S., Scranton, Pa.; L. S., Cleveland, O.; W. B., Marion, Ind.; S. G. M., Portland, Ore.; H. J. B., Fishers Island, N. Y.; H. H. E., Ridgway, Pa.; V. S., Portland, Ore.; J. M. W., Portsmouth, Va.]

No. 41.—Commutator Trouble on Elevator Motor.—We have had some trouble with an elevator motor. My employer claims it was caused by lack of care, but I contend that the mica under the commutator bars was defective. Two adjoining commutator bars melted the solder holding the wires in them, but there were no other markings and the mica

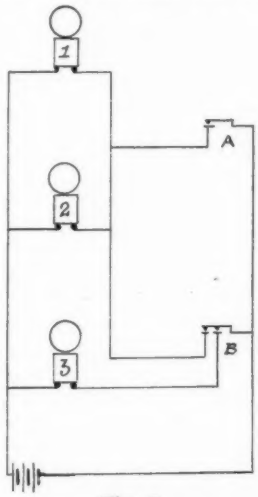


Fig. 2.

between them was not burned on the outside. Two weeks later a bar on each side of the first two acted in the same way. The elevator ran for a while with the solder partly melted from the four bars. Could this trouble have been prevented by better care of the brushes and commutator, or is it due to defective insulation under and around the commutator parts?—G. S. M., Kansas City, Mo.

From what you say I should think that the defective mica was between the segments, rather than under them. We have quite a little trouble of this kind and it usually comes from dirt and grease or oil working its way up the end ring of the commutator, after which one can see minute sparks once in a while run around the commutator. These continue to eat their way into the mica between the segments and "short" the coil enough to either throw out the solder or cook the coil or possibly both. We have had several of these accidents happen where one could not see a thing

wrong from the outside appearance, but on taking the commutator apart the mica was found to be eaten between the segments to a depth of one-half inch, and the trouble had worked its way part way through the mica ring under the segments. I would not say that better care of commutator surface or brushes would help a great deal, as probably your trouble started from underneath.—E. M. R., Saginaw, Mich.

Commutator trouble on the elevator motor mentioned is in all probability due to the mica ring under the commutator becoming carbonized on account of dirty oil around the commutator. I have had similar trouble with motors and if the trouble is not removed it will lead to burning of the armature coils that connect to the short-circuit bars. This may also lead to troublesome grounds, and, in fact, if allowed to run on, it will injure the entire commutator.—J. M. W., Portsmouth, Va.

In all repairs of direct-current and alternating-current motors and generators great care must be exercised in distinguishing between cause and effect. Melting of the solder in two or four commutator bars is due directly to a partial or total short-circuit in one or two particular coils in the armature winding. The short-circuit may be caused by the accumulation of carbon dust or copper dust on the face or back of the commutator, or by the projection of solder on the back of the commutator, or, last but not least, by defective insulation of the winding or careless winding. A defect may not show in a new machine under ordinary conditions but be quite prominent at full load or 25 or 30 per cent overload, of which elevator motors get plenty.—V. S., Portland, Ore.

No. 42.—Voltage Control for Low-Voltage Direct-Current Sign Lamps.—We have a direct-current sign containing 700 twelve-volt, five-watt, tungsten sign lamps wired ten in series on 110 volts. Frequently the voltage boosts up too high and burns out quite a few lamps. Is there a regulator we could use on the main 110-volt circuit to keep the voltage down to a safe value for these five-watt lamps?—A. J. D., Chicago.

It is possible to control the voltage on a direct-current circuit if one is willing to install the necessary apparatus, but the simplest plan for sign work is to put such a number of lamps in series that they will receive the highest allowable current when the voltage has its highest value. Of course, when the voltage drops, the lamps will not be so bright, but it is better to have this condition than to have constant burnouts due to over-voltage. It is desirable that all the lamps connected in series be rated at the same value of current.—M. G. L., Oak Park, Ill.

No. 43.—Safe Use of Disconnecting Switches.—Is it ever safe to open a disconnecting switch on 4,000 volts while the circuit is still alive? A friend of mine recently had his arm badly burned while hastily pulling such a switch in order to save a fellow workman from danger. He did not have time to get to the oil switch.—J. E. N., Pittsburgh, Pa.

Disconnecting switches are not designed to be opened while the current is alive, as this always results in a destructive arc that may seriously burn the operator or, at least, fuse the knife blade and contacts and render the switch unserviceable. It is conceivable that in an emergency the opening of a disconnecting switch may prevent more serious damage. If the switch has to be opened it should be done with a long wooden pole having a hooked end. However, in a well managed plant it should not be possible for any one to have dangerous access to live high-tension circuits and the switchboard attendant should be able to open any oil switch when the occasion so demands. To prevent the opening of live disconnecting switches some types of these are now made that have the blade automatically locked until the current is "off" the line.—S. L., Chicago, Ill.

Disconnecting switches are made to open with the circuit alive up to 60,000 volts. These switches are generally used to disconnect a bank of small transformers or a substation. They have a long break and frequently a horn gap. I know of a case where this type of switch, working in connection with an overload attachment, opened a "short" on a large 60,000-volt system. However, the small knife-blade type of disconnecting switch with a short break which is commonly used in connection with oil switches should never be used to break a current, no matter how small. The latter type is no doubt the one which is referred to.—C. T. P., San Francisco, Cal.

Disconnecting switches are not made for opening while the load is on; they are installed for disconnecting a substation or a piece of apparatus from the power mains so that necessary repairs can be made without the danger of having the oil switch closed by a distant or careless operator. However if the disconnecting switch is properly designed with a quick-break blade, it may be opened in service. Even then in opening such a switch a wooden pole not less than four feet long should be used; after the hook in the end of this pole is connected to the switch it is advisable to turn the head away when quickly pulling the switch, so that the flash will not hurt the eyes.

Permanent injury to the eyes has sometimes been caused by the thoughtless or careless opening of disconnecting switches.—J. M. W., Portsmouth, Va.

MERCURY AMPERE-HOUR AND WATT-HOUR METERS.

By Joseph B. Baker.

The extreme mobility of mercury and its nature as a liquid metallic conductor have given a fascination to its use in electrical work where low-resistance contacts with moving parts, associated with minimum contact friction, has been sought. The motor meter has been one of the devices in which mercury has been employed with varying degrees of success.

The first really operative motor meter, consisting of a Faraday-disk motor turned over on its side (disk horizontal instead of vertical) was constructed in England about 1883 by George Hookham. This meter was simply a copper-disk armature in an open mercury receptacle with the poles of a permanent magnet approaching close to each side of the disk, and with the load current passing from the edge to the center of the disk. Since 1889 Hookham (now Chamberlain and Hookham) has greatly improved his meters, and now makes a line of highly developed mercury meters having special features to prevent spilling of the mercury, etc. This meter is sold in this country under the name "C H," as an empere-hour meter for registering the current consumed in electric cars.

A number of variations of the Hookham type have been patented and made by Perry, Evershed, Reason, Hakey and others.

About the same time as Hookham's first success, Ferranti produced his first mercury motor meter. In this meter, which differed widely in construction and operation from Hookham's, the moving element, consisting of light vanes fastened to a vertical shaft, was submerged in mercury contained in a shallow disk-like closed receptacle. By a suitable permanent magnet, one flat face of this receptacle was magnetically polarized positively and the other face negatively. Current was led in around the periphery and out through a contact placed near the center, so that the apparatus formed a homopolar motor. As the mercury itself carried the current, the torque was produced in it and it was rotated at a speed approximately proportional to the current and to the field strength, conveying the paddle-like moving system around with it; and the motion of the latter was transferred to a recording train in the usual way. An excellent meter is now made by Ferranti, having these general features of operation.

The first mercury meter in the United States was made by Hakey in

1900. But this meter was simply an ampere-hour meter, and crude mechanically, and very few were made.

The "C H" ampere-hour meter is stated to be the development of twenty-five years' experience in the manufacture of electricity meters exclusively, and is designed to record the energy consumption of electric cars. The use of watt-hour or ampere-hour meters on street cars is a coming field for the meter and one which has as yet only been scratched. It is important to have some definite check on the power consumed under the control of motormen operating the costly equipment of the traction companies, since the power for running, lighting and heating the cars represents the total output at the power plants. Green, careless or otherwise incompetent motormen thus have the company's earning power largely at their mercy. John W. Corning,[1] in an address entitled "The Economical Use of Power," states that a single large street-railway operating company pays out over a million dollars a year for power to operate its trains and cars and adds: "Any legitimate economy that may be effected in the use of power is therefore well worthy of effort."

Fig. 1.—Interior of C. H. Ampere-Hour Car Meter, Showing Damping Disk.

The advantages of the record given by an ampere-hour or a watt-hour meter on electric cars may be summarized as follows: (1) a check on the motorman and on the conductor; (2) aggregate current or kilowatt-hours consumption of all cars as a check against the record of station output, in determining transmission losses, etc.; (3) a comparison of the energy consumption of different car equipments under determined conditions; of the energy consumption on different car lines having known traffic conditions; of similar car equipments on the same car lines under different conditions of weather, track, etc.; (4) data for the determination of practical figures on the consumption of current or of kilowatt-hours per car-mile on the railway system as a whole.

The records of the ampere-hour meter must of course be interpreted with due regard for variations in voltage in comparing them with any figures connected with the energy in the coal-pile or delivered at the switchboard.

The driver of a car equipped with a reliable meter will be sure to report anything about the car (electrical equipment, running gear or brake equipment) which causes extra consumption of current.

The C. H. Ampere-Hour Car Meter.

The C. H. meter illustrated herewith (Figs. 1 and 2) is designed specifically for street-car work and is constructed with an internal shunt so that the meter itself takes 50 per cent of the total load current. The meter consists essentially of a single permanent magnet with a horizontal copper disk submerged in mercury and arranged to rotate between the magnet poles. It is a remarkable feature of this meter that a single steel magnet furnishes the field for both the driving and damping elements.

The disk or armature is slotted radially to prevent eddy currents, and to constrain the current traversing the meter into a straight path. On the vertical spindle, and above the mercury submerged disk, is another somewhat larger disk, arranged to rotate between other pole-pieces of the same magnet (in magnetic parallel with the first pair of pole-pieces), and serving as a damping disk or magnetic friction brake to control the speed of the meter. This moving system is geared to a "jump" cyclometer counter (in which the figures jump into place behind their openings in the face-plate of the counter) registering in ampere-hours. Obviously a jump cyclometer dial is of great advantage in street-car work where the meter is read by the motorman at the start and end of his trip and the latter reading checked by the next motorman who takes the car out—on account of the simple reading feature, which not only practically eliminates errors of observation but causes the motormen to pay attention to their work in driving their cars economically. The plain figures showing current consumption give an easily noted record and encourage competition among the men which saves the company much electrical energy at the power station and much brake-shoe expense on the cars.

The operation of this meter is as follows: When the armature is in place, immersed in mercury, current entering at one of the contact ears will pass through the mercury to the armature across the latter in the general direction of a diameter, to the mercury in the vicinity of the other contact ear, and via the latter to the external circuit. In going thus across the disk the current passes through the magnetic field twice, once at each pole of the magnet; and as these two fluxes are in opposite directions the two torques produced will be additive, and the disk will tend to rotate as in the Faraday experiment.

The rotating element floating in the mercury bath which submerges the lower disk, is stated to be extremely light so as to bring the inertia of the system down to a minimum. The immersed copper disk is specially treated to prevent the mercury from dissolving

1 Mr. Corning is electrical engineer of the Boston Elevated Railway Company, and his address has been reprinted in pamphlet form by this Company for the instruction of its motormen.

the copper. The weight and displacement of the rotating system as a whole are so proportioned that the rotating system bears with very slight pressure on the bottom bearing. An interesting point is that the bearing is inverted, as compared with American jewel step bearings, being arranged with a fixed ball-pointed pivot below, supporting the slightly cupped end-stone jewel, fitted with a cylindrical guide, at the lower tip of the spindle.

One of the advantages that has been claimed for this design with a sinking (instead of a buoyed-up) rotating element is that an air-bubble which may be caught under the immersed disk—as in pouring in the mercury, or in the agitation of the meter in handling or shipment—will reveal its presence by the lift on the rotating element. The cushioning effect of the mercury is depended upon to prevent the jarring of the car on which the meter is installed from affecting the bottom pivot of the meter and consequently no spring suspension is required with this type.

Permanent accuracy is secured without means of adjusting the magnet or varying its flux by employing a tungsten-steel magnet of great length and cross-sectional area (both absolutely and in proportion to the air-gap), and by special construction of the damping pole-pieces. The damping pole-pieces are formed with a nick or constriction below the pole-face of such reduced diameter compared with the diameter at the face of the pole-piece as to supersaturate the iron at this point. By this construction a considerable weakening or demagnetization of the magnet may take place without destroying the relation between the damping and driving effects in the meter. With plain pole-pieces for both damping and driving fluxes, any reduction in the strength of the magnet would decrease the damping as the square of the change in flux and the driving as the first power of same, which would result in increased speed of the meter. It is claimed that constant speed is obtained. although the strength of the magnetic field may not remain constant.

Compensation for mercury surface-tension friction on the higher loads is effected by a "correction coil," which corrects the damping effect in proportion to the square of the current passing thereby neutralizing the increase of fluid friction, since the latter is proportional to the square of the speed which in turn is proportional to the current passing. The heavy cast-iron inclosing case greatly reduces the demagnetizing effect of strap fields.

The cyclometer counter is of the jump type, adapted to the elimination of mistakes in reading by clear figures reading from thousands to tenths. The extra friction of an ordinary cyclometer train at the moment of changing from 9999 to 0000, which under some conditions is sufficient to stop the meter at this point, is overcome by an ingenious device. Attached to the first dial is a light spring which is wound up during the time of registering one unit on this dial; and at the moment of changing all four dials at once the store of energy in this spring kicks over the dials instantaneously without increasing the load on the meter. A simple resetting device can be fitted to the meter to allow trip readings to be taken if required.

This meter is shipped with its mercury chamber empty, and the correct amount of mercury (which accompanies the meter in a separate bottle) is poured in at the top of a short iron tube standing in front of the meter and a little to one side of the center (Fig. 1). The meter is secured to the woodwork of the car by screws passing through porcelain insulators.

The necessity of extreme ruggedness in a meter which is to stand up under the strenuous conditions of street-car service has been apparently well looked after in this matter. Although the size and weight of the meter are very great, in comparison with American service meters, it is claimed that this ultra-substantial construction has been dictated by considerable practical experience in street-car work abroad.

Fig. 2—Vertical Section of C. H. Ampere-Hour Car Meter, Showing Lower Disk Immersed in Mercury.

Fourteen-Mile Ride for Five Cents.

On January 29 the Chicago City Council passed the ordinance authorizing the sale of the Chicago & Southern Traction Company's line within the Chicago city limits to the Chicago City Railway Company. The interurban line of the former company that runs to Kankakee, Ill., is thereby given a direct entrance to the center of Chicago and permission is given to carry express matter on these cars between 11 p. m. and 5 a. m. This is the first privilege of the kind granted in Chicago. On the other hand, local passengers on the Vincennes Road line are given a five-cent trunk-line ride from the center of the city to One Hundred and Eleventh Street. This is believed to be the longest radial ride from a city's center for a five-cent fare, although still longer cross-town rides are now available. With the exception of a half-mile line near the western city limits, all of the Chicago street-car lines are now controlled by the Chicago City Railway Company and the Chicago Railways Company.

Platinum Output of New South Wales.

Platinum is found in paying quantities in New South Wales, Australia, where the yearly output amounts to over 300 ounces. At the present price of platinum this has a value of over $14,000.

Convention of Illinois Contractors.

Mid-Winter Meeting of the Associated Electrical Contractors of the State of Illinois, Chicago, February 2 and 3.

The semi-annual convention of the Associated Electrical Contractors of the State of Illinois was held at the Hotel Sherman, Chicago, February 2 and 3. There was present at the sessions of the convention a large attendance representing the electrical construction interests of the state.

The initial meeting of the convention was an executive session in which only matters of local interest to the Association were considered.

The first session of the convention for the consideration of technical matters relating especially to the trade began at two o'clock in the afternoon on the opening day of the meeting. The first matter taken up here for consideration was that of transportation arrangements for the benefit of members who contemplate attending the next annual convention of the National Association of Electrical Contractors, which will be held at Denver, beginning July 17. Representatives of the Chicago & Northwestern Railroad who were present were called upon to explain the facilities which that road will provide on the occasion in question. These gentlemen stated that the railroad fare from Chicago to Denver and return would be $30, exclusive of meals and Pullman accommodations, and that every possible provision would be made by the railroad company for the comfort and proper entertainment of all who may desire to make the trip. It was stated also that if a party of 75 members of the Association could be formed, a special car would be provided. It was further explained that special excursion rates would be provided on this occasion for the benefit of those who may care to visit the Yellowstone Park at this time, the round-trip fare from Chicago to the park and return being fixed at $90.

The discussion of transportation to the convention of the National Association having been concluded, President Gibson announced that the rest of the session would be given over to an informal discussion of such matters relating to the electrical contracting business as the members present might wish to hear discussed. At the suggestion of Ernest Freeman, the chair called upon Earnest McCleary, of Detroit. Mr. McCleary spoke at some length upon the folly of price-cutting on the part of electrical contractors, and stated that the contractor should always make it a point to get a reasonable price for his work or else not undertake the job. He also spoke of the work of the National Association and urged members of that body to be guided by its principles and recommendations.

At this point William McGuineas, of Chicago, suggested that Mr. McCleary favor the convention with some remarks on the relation of the electrical contractor to the general contractor. Discussing this matter, Mr. McCleary said that in his opinion the electrical contractor should generally submit his bids on jobs of wiring either to the architect or to the property owner himself, rather than to the general contractor. In his own experience in electrical work, he rarely submitted a bid on any prospective job to the general contractor.

Speaking further, Mr. McCleary touched upon the relation of the contractor to the supply man. He thought that the business of the two should be kept distinct. In short, he argued that it was the function of the central station to sell current; that of the manufacturer to produce, the jobber to distribute and the contractor to take care of the consumer and not sell anything he does not install.

The next question to come before the convention was that of the education of the contractor in the matters of cost-keeping and estimating prices. This subject was discussed by J. T. Marron, Charles R. Kreider, E. F. Pendergast, J. N. Pierce, E. McCleary and others.

Mr. Marron thought that this work should be carried on through the National Association of Electrical Contractors. A representative of that body, he maintained, should engage continuously in the business of visiting the various members of the organization for the purpose of discussing the matters in question. This man would soon become a specialist in his line and the benefits derived from his work would be of inestimable value in the contracting field. Mr. Marron also spoke highly of articles on electrical contracting which appear from time to time in certain engineering magazines and stated that these would be of great value in the proposed educational work.

Mr. Kreider, who was called upon by members of the Association for an expression of opinion, began his talk with some remarks on the necessity of better methods of estimating overhead expenses in electrical contracting. He said that some contractors made the volume of the year's work the basis for computing their overhead; an objection to this was that the larger contractors generally have on hand at the end of the year big contracts which must be completed in the following year, thus making it difficult to figure accurately the exact volume of business for any given period. Mr. Kreider thought that overhead expenses should be computed on a labor basis—or what he called the man-hour basis. Proceeding to the discussion of the education of the contractor in the matter of cost-keeping and price-making he stated it as his opinion that this work should be undertaken by the Associated Electrical Contractors of the State of Illinois itself, which should employ a salaried representative to engage regularly in this work. After the scheme had been tried and found to be a success the matter might be turned over to the National Association, which would then be in a much better position to prosecute the work intelligently and systematically. Because of the large territory which the National Association covers, a single representative of that body would be seriously handicapped in taking the initiative in a movement of the kind under consideration.

At the suggestion of Mr. Kreider, concurred in by other members present, the chairman appointed a committee to make recommendations to the Association relative to this proposed educational campaign. The committee consisted of Messrs. Marron, Decker, Collins, Pierce, Kreider and McGuineas. The chair instructed the committee immediately upon its having been appointed to retire and bring in its report. Later in the afternoon the committee reported that the only recommendation it was then in a position to make was that an appropriation of $500 be provided for the prosecution of the educational compaign. A vote to make this appropriation was passed and the committee was granted further time to formulate and recommend a definite and systematic plan for the proposed undertaking.

During the afternoon session the relation of the central station to the contracting business came in for a rather free discussion. J. T. Marron stated that some of the new business departments of certain central stations

were carrying on a campaign which was hurtful to profitable electrical contracting. It was formerly true that he did a great deal of work on a time and material basis. This he thought was true also of other contractors. The solicitors of the central stations, however, obtained jobs of wiring on the contract basis, and if the electrical contractor himself undertook to do this work for the central station, it often had to be done at a price so low as to preclude the realization of a legitimate profit on the work. Other members of the Association did not wholly agree with Mr. Marron. C. E. Stapp, of Peoria, thought that the contractor should not allow the central station to get this new business; the contractor himself should go after the job before the central-station solicitor had to undertake to get it. He said that this was the common practice in Peoria and that here the contractors had no trouble in getting new business for themselves, and the central station as well.

J. N. Pierce, following Mr. Stapp, explained that central stations engaged in the business of soliciting wiring for the sake of the additional sales of power which it makes possible. He thought if the contractor would be sufficiently active in his efforts to get new business he would encounter but little competition on the part of the central-station business department. At this point Mr. Pierce stated that he wished to read some "pluggers" which he had prepared. These epigrams proved to be very applicable to some of the subjects before the meeting.

Henry Newgard stated it as his opinion that the central-station interests could in most cases be readily induced to give up electrical construction work altogether. The only thing necessary, as he saw it, was that the local contractors manifest the proper enthusiasm for getting new business.

A further matter brought before the convention for consideration was the alleged practice on the part of some central stations of selling supplies at prices with which the local contractor could not possibly compete. It was stated that in certain localities the central station sold lamps and heating devices and other appliances at a price which the contractor had to pay when he bought this material wholesale. Other members, however, had not encountered this difficulty. One contractor stated that he conducted a store only three or four doors from the headquarters of the central station in his town and he did not find it difficult to realize satisfactory profits from his business there. In the further discussion of this subject Mr. Kreider said that many contractors who are also merchants made the mistake of not segregating the two branches of their business in the keeping of accounts.

Warren Orne brought up the matter of the relative merits of conduit construction and knob and tube wiring for concealed circuits, and was disposed to insist that steps be taken looking toward the elimination of the recognition of the knob and tube wiring from the National Code. Mr. McCleary took the stand, however, that while some form of armored construction is far preferable to knob and tube wiring for concealed work, knob and tube wiring has its proper field and will probably continue to be installed in the less congested sections of the country for a long time. Since the National Code applies to the entire country, it would, in his opinion, be very unwise for the Code not to permit knob and tube construction. During the further discussion of this matter the relation of the contracting business to the work of the electrical inspector received considerable attention. The opinion was expressed that the contractor would be better off without the municipal inspector, but in this opinion very few of those taking part in the discussion concurred. On the contrary, the importance of the inspector as an exponent of better wiring practice was given considerable emphasis.

Before the close of the session an abstract of the employers' liability law was read and this act commented upon by various members. It was stated that any employer who did not desire to carry on his business under this act might be relieved from the obligations thereof by notifying the Bureau of Labor of his intentions before May 1. It appeared that most of the contractors present wished to be exempted from the provisions of the statute in question.

Addresses on Electrical Contracting.

The final session of the convention was devoted to addresses on the general subject of electrical contracting. J. N. Pierce, of the Pierce Electric Company, Chicago, was called to the chair, and, at the request of Ernest Freeman, explained fully the program of the meeting. He pointed out that three prizes would be awarded at the close of the session. An award of $125 would be made for the best address, while for the second and third best talks $100 and $75, respectively, would be given. He explained further that any electrical contractor present, whether a member of the Association or not, might take part in the contest; that no other subject than contracting must be discussed; and that all members present would be expected to vote in deciding finally which of the addresses were most helpful and able.

Nineteen contractors took part in the contest, the maximum duration of any one address being fifteen minutes. The first prize was won by Charles R. Kreider, of the firm of Kohler Brothers, electrical contractors and engineers, Chicago; R. W. Poelma, of the Peerless Electric Company, Chicago, won the $100 award; while William McGuineas, of the United Electric Company, Chicago, was awarded the third prize.

Mr. Kreider's talk was along the line of suggestions for better business methods in electrical contracting. He said that the commercial ratings of the contractors of the country was poor; that, in fact, business concerns ranked electrical contractors, as a class, among the poorest of credit risks. Passing to an explanation of this fact, he stated that a condition which operates powerfully toward the continuance of this state of affairs is that the contractor does not insist on a reasonable price for his work; he seems to think that success simply means keeping busy, and so in bidding on work he is often governed largely by what he thinks competitors will bid, or perhaps have already bid, rather than by a proper consideration of the probable cost of doing the job. Mr. Kreider contended that instead of talking price to a customer, the contractor should talk quality first, and then insist on a price which will make work of a high quality possible and profitable. He thought also that many contractors make a serious mistake in not maintaining sufficient office help, it being, in his opinion, very poor policy for a contractor to allow a large part of his time to be taken up with office routine which could as well be handled by assistants who could be employed for a relatively small sum.

The speaker argued further that the contractor makes a mistake by bidding on every job. Only bid on such jobs as you are reasonably certain you have a fair chance of getting was the substance of his advice along this line. Moreover, in making an estimate, the job should be divided into its component parts and these parts figured separately. Before the estimating is seriously begun, however, the contractor should acquaint himself with the financial standing of the party for whom the work is to be done. Having satisfied himself that this is good and that he has a chance to secure the work, the contractor is ready to begin a careful study of the plans and specifications looking toward the preparation of a bid.

When the job has been undertaken,

the contractor should keep his men supplied with blank forms for orders for extra work not contemplated in the contract, and no extra work should be done until the proper written order for it has been given. Mr. Kreider thought, too, that bills for extra work should be collected very soon after such extras have been completed. It is much easier to collect for extras then than after the extras have been partially forgotten.

The speaker thought, moreover, that every contractor should keep a classified list of jobs and keep it up to date. He said, further, that the contractor should guard against taking jobs too large for his resources, and that he should be very careful to keep his credit good. Finally, the electrical contractor should co-operate with his fellows in the business. Join the contractors' association, both local and national, was the speaker's closing advice.

Mr. Poelma's address was confined largely to the discussion of the relations existing between the electrical contractor on the one hand and the general contractor, the architect and the electrical engineer on the other. He thought that the electrical contractor should have confidence in himself and take care of his own work independently of any possible misdirected advice from others.

Mr. McGuineas directed his remarks principally to the subject of competition among contractors. In this line of business competition, he argued, was ruinous. The only sort of competition here is a generous rivalry in the matter of doing better work.

Other speakers were: W. W. Jackson, of Chicago; L. B. Van Nuys, of Peoria; C. G. Rush, of Chicago; Alex Schulman, of Chicago; J. T. Marron, of Rock Island; A. M. Knauber, of Oak Park; W. S. McKillip, of Chicago; F. B. Bolte, of East St. Louis; John Wickum, of Chicago; E. F. Pendergast, of Rockford; and Warren Orne, R. C. Bierdman and B. L. Aiken, all of Chicago.

The remarks of these speakers were confined mainly to the matters of cost-keeping, estimating, and taking care of the overhead expense. Incidentally, such subjects as the need of closer co-operation and the better education of the contractor came in for some additional consideration.

Mr. Marron, for example, quoted statistics to show that within the last twenty years 65 per cent of the electrical contracting concerns in the United States had failed. He was glad to be able to say, however, that conditions were improving, and gave it as his opinion that co-operation was responsible for this improvement, largely. Mr. Bolte, speaking along similar lines, said that in his town there were two large contracting concerns, but these were not really competitors. When one of these had bid on a contract, the other was usually free to examine the bid if he cared to do so; such a procedure did not generally affect the bid of the either of the contractors materially. Since they both insisted on a reasonable price for work. Mr. Bolte also made some rather pertinent remarks concerning the proper amount of public spirit on the part of the contractor. He thought he should take a lively interest always in local public and business matters.

Mr. Jackson described at some length his methods of cost-keeping, which proved to be very interesting to the contractors present. He explained that he was always able to find out within a few minutes just the amount of money that had gone into labor and material on any particular job, in whatever stage of installation the job may be. He pointed out also that his company figures overhead expenses at ten per cent.

It was contended by Mr. Oorne that if the architect wasn't willing to furnish a contractor with a special set of plans, it was usually a good sign that he had some other contractor slated for the job. He deplored the practice of the hasty preparation of estimates from plans which were not allowed to be taken from the architect's office, and created considerable merriment by exhibiting a large pen and ink sketch of a contractor engaged in trying to recall from memory the items which he had forgotten to include in making up an estimate for a bid of his which had just been accepted.

Mr. Van Nuys said that the inspectors were putting irresponsible wiremen out of business. He emphasized the necessity of correct methods of estimating, and warned contractors against trying to carry too much wiring supplies.

Alex Schulman and others mentioned already spoke along the lines suggested above. The meeting was followed by a banquet, arranged by the Entertainment Committee, of which Ernest Freeman was chairman.

The next convention of the association will be held in June, at Rock Island, Ill. The officers of the organization are: E. E. Gibson, Decatur, Ill., president; N. M. Blumenthal, Chicago, secretary; and J. N. Pierce, Chicago, treasurer.

The Banquet and Entertainment.

On Saturday evening about 300 contractors and their guests attended the banquet and entertainment in the Crystal Room at the Hotel Sherman. There was a very gratifying attendance of the ladies, and the dinner course and entertainment features were highly enjoyed. Brief remarks were made by the presiding officers of the affiliated associations, and this part of the program was supplemented by a number of excellent vocal and instrumental musical parts.

Electrical Exports for December and for the Year 1911.

The Bureau of Statistics of the Department of Commerce and Labor, Washington, D. C., has completed its monthly summary of the imports and exports of the United States for last December and therefore also its annual summary for the calendar year 1911. From these sources the following data on the corresponding electrical exports are obtained.

December proved to be a record-breaking month in every way. The total electrical exports were the largest on record, as were the shipments of the subclass, electrical appliances; the exports of electrical machinery were the heaviest for any month since 1907. The year 1911 as a whole was the best one to our electrical exporters, the total greatly exceeding the previous record year, 1907. The increase in shipments of electrical appliances since that year has been nearly 50 per cent. The comparative data for the twelve months of 1911 and for December, 1910, follow:

Month.	Electrical Appliances.	Electrical Mach'y.	Total Electrical Exports.
Dec., 1910	$826,188	$646,639	$1,472,822
Jan., 1911	965,936	687,536	1,653,472
Feb., 1911	939,714	551,885	1,491,599
Mar., 1911	915,001	639,338	1,554,339
April, 1911	1,064,562	888,283	1,952,845
May, 1911	987,264	627,840	1,615,104
June, 1911	884,839	825,091	1,709,930
July, 1911	707,214	584,715	1,291,929
Aug., 1911	725,145	666,544	1,391,689
Sept., 1911	841,769	658,831	1,500,600
Oct., 1911	851,650	583,000	1,434,650
Nov., 1911	955,706	723,860	1,679,566
Dec., 1911	1,168,612	910,601	2,079,213

The comparative totals for the last five years are given in the following table, which clearly shows the recent evolution of the electrical export trade:

Year.	Electrical Appliances.	Electrical Machinery.	Total Electrical Exports.
1907	$7,725,545	$9,735,230	$17,460,775
1908	5,657,008	6,956,722	12,613,730
1909	7,063,804	5,963,746	13,027,550
1910	9,844,438	7,156,688	17,001,126
1911	11,008,012	8,347,524	19,355,536

Reverting back to the figures for last December, the principal countries to which electrical shipments were made and the values of these exports are given in the following table:

Countries.	Electrical Appliances.	Electrical Machinery.
United Kingdom	$ 95,612	$179,659
Canada	333,911	131,057
Mexico	115,402	81,677
Cuba	71,290	52,584
Brazil	205,214	110,882
Japan	52,476	77,223

THE CENTRAL STATION AND ELECTRIC TRUCKS.

By Arthur Williams.

In a recent special issue of the New York *Journal of Commerce and Commercial Bulletin*, Mr. Williams, of the New York Edison Company, presented the following interesting resume of the development of the electric-truck business and the attitude of the central stations in fostering this development:

Let any thinking man stand on the corner of some downtown business street—say, West Broadway, Canal or West Streets—and watch the enormous slow-moving stream of horse-drawn trucking roll onward. Then, presently, worming its way through the jam of traffic will come some motor truck. It takes but half the space of the horse wagon and makes twice the speed as it threads its way in and out among the lumbering teams at the ready control of the operator. This is the reason for the commercial vehicle—speed, control, and, when properly applied, economy far beyond that of the horse truck.

For the central station there are just two kinds of commercial motor truck—those that are electric and those that are not. The thoroughly broad-minded central station, which has the real interests of its customers in mind, will cast no aspersions at the powers and capabilities of the gasoline car. In its own field, where great length of haul and high speed are required, the gasoline truck is undoubtedly admirable.

On the other hand, the specialty of the electric car is economy of operation within a twenty-mile radius. Where an electric truck should be employed at all it is far better than any other, but it should be remembered that this type of car has its limitations, and when an electric doesn't evidence marked economy it probably is being applied to a class of work for which it is not fitted.

According to the preliminary figures of the Thirteenth Census there were 3,639 electric vehicles manufactured in 1909, an increase of 160 per cent over the corresponding figures for 1904, and yet it is since 1909 that the electric truck has been making its greatest strides in popularity and usefulness.

Just to show the steady increase in the electric vehicle business it may be noted that more than 4,500 pleasure cars were sold during 1910 and that in 1911 the output for the first six months exceeded even this figure. The returns for the entire year's sales are not yet in.

The electric vehicle has long since passed the point in its career where its constructive features might be looked upon as experiments. For more than five years it has filled its place, and has filled it well, not only in the commercial field but in competition with pleasure cars in the city.

The electric is essentially a town car, where the demands upon it do not include long runs nor require road-burning speed but do make absolute control a first consideration. To illustrate this, take the delivery department of a great dry goods store serving an area of from fifteen to twenty miles, practically all within city limits. The traffic manager wants a car that will go to the end of the route and come back, one in which the danger from fire is entirely eliminated, that can be easily controlled in a jam of traffic and that can be maintained at a minimum of expense. He finds such a car in the electric.

If his house has a suburban business with a delivery center thirty or more miles away, he requires a car that will not only carry a great load from the store to the suburban delivery point but one that will make the run in fast time. Here he finds the gasoline car more suitable to his requirements, for with it several round trips can be made during the day.

It is the same with the pleasure car. Built primarily for town purposes it serves the professional man as he makes his round of calls; is used by the women on their shopping and social visits and by the family in the evening to go to and from the theater. It is not, however, the car that would be selected for a long cross-country tour.

These illustrations are to make clear that the field of the electric car, while restricted, is one within the limits of which no other type of car can serve so well. As to the relation of the central station to the electric-vehicle industry or the influence it may have there are many points to be considered. Almost without exception local conditions present varying problems. The central station, of course, has a vital interest in the electric-vehicle situation within its territory. It is a desirable source of revenue not only for the profits accruing but for the fact that the current sold to electric-vehicle users is generally taken at a time when the generating plant is not being pushed to meet a maximum demand; in other words, it is an off-peak load.

To have the central station take an active part in the vehicle situation is desirable not only to the company but to the public as well, and can be found fault with only by a certain few of the less scrupulous dealers. Aside from the fact that the electric vehicle provides a desirable source of income to the central station the light and power company must take a hand in the matter for other reasons. First and foremost the central station is a public-service corporation and the public has the right to the best sort of service within the field of that corporation, whether it be light, heat or power. The central station should be in a position to serve the customers who use trucks just as much as those who employ current for illumination or motor drive. Self-interest will in the end prove to be the public interest.

Before embarking on the electric vehicle campaign, however, the electric company must adopt a policy which it should adhere to unwaveringly. In deciding upon this policy choice must be made of one of two courses—to act simply in an advisory capacity or to enter the field in an active and competitive manner. In making this choice local conditions in the trade are the guiding factor and they must be looked at from a many-sided viewpoint. The integrity and the qualifications of the men likely to be engaged in the business must be considered. The facilities offered or likely to be offered for the care of the cars and the attitude of the public toward the dealers and toward the central station are some of the other important considerations.

In New York there is a keen and healthy competition among the electric-vehicle dealers, just as there is in every large city where the field seems promising. Where such competition exists it is probably wiser for the central station to adopt the advisory course instead of becoming a competitor of the manufacturers. This has been the attitude of the New York Edison Company in the local territory. An Automobile Bureau has been organized and has been the means of bringing about closer relations between the public, on the one hand, and the dealer and the company, on the other.

This Automobile Bureau keeps a card file of all the electric-vehicle users in the city, and on this card are recorded details of the owners' business, the garage location and other facts of interest. Owners are notified by letter of the readiness of the company to assist in the care and operation of the cars. This registration is obtained from the State License Bureau, and whenever a new owner appears the bureau volunteers its assistance. In this way the company keeps in touch with the operation and maintenance of almost every

electric vehicle in the city, obtaining valuable data as to the cost of upkeep, etc. Through the activity of this bureau a number of cars long in disuse have been returned to service.

A list of business men now using horse-drawn vehicles is also kept. Those whose business seems to warrant the adoption of the more economical method of transfer are canvassed regularly, principally by means of followup letters. Personal visits are made on those who inquire for further information. It is the duty of the man making these calls to ascertain the requirements of the case and to decide whether or not the electric is the best car suited to its particular needs. If so, he furnishes the prospective customer with figures showing the first cost as well as the cost of maintenance. He also gives a list of electric-vehicle users, in case a reference is wanted, together with a list of the local representatives of the vehicle manufacturers. With his consent the prospect's name is sent to the representative of the car under consideration with a request that a salesman call. The bureau keeps in touch with the case until the sale is closed.

If the purchaser wishes, the bureau directs the installation of the garage apparatus, or if the owner does not wish to care for the car himself he is given a list of reliable garages. Thus the bureau not only aids the manufacturer in his selling campaign but brings new business to the garage man as well as assisting the owner in finding garage facilities.

Electric-vehicle manufacturers not represented in the city are kept posted as to the central-station activities in the automobile field and proof sheets of all advertising are sent them. This activity on the part of the central station has resulted in an increase in the number of selling agencies in New York. During the past year many manufacturers who had not previously attempted to sell in the territory assumed an active part in the vehicle campaign.

The central station operating in a field that has been neglected by the vehicle manufacturer frequently begins an aggressive selling campaign, advertising itself as the representative of the manufacturer, maintaining a well-equipped garage, having demonstrators ready to show the various cars and does all in its power to educate the prospective customer to the advantages of the vehicle.

The field of the electric vehicle is large, since the tasks for which it is fitted are many. The electric truck is really a powerhouse on wheels. It can transport enormous loads; is equipped with a winch and motors that will hoist heavy burdens; it will carry extension ladders and derricks for aerial work and do heavy hauling of all kinds. The smaller wagons are clean, expeditious, noiseless and reliable, while the pleasure cars are all that can be desired for town purposes. With all this goes the absolute freedom from fire risk assured by the use of the vehicle.

Since the advent of the central station in the vehicle field the business has increased as much as 300 per cent in some localities. This represents in actual numbers from 200 to 2,000 cars, according to the size of the city.

The question has been discussed, Is central-station activity in the electric vehicle field justified? It was fittingly answered at a recent meeting of the Electric Vehicle Association of America on December 19, when Stephen G. Thompson said: "The central stations have emphatically decided the question in the affirmative and their consequent activity has already been fully justified."

Electric Heating to Be Employed Extensively in Sweden and Norway.

The development of the abundant water-power resources of Sweden and Norway is affording an excellent opportunity for the extensive employment of electric heating devices of all kinds and particularly such as are adapted to the heating of rooms. Fuel is expensive throughout Scandinavia. The water-power developments that have been made have not attained a very good load-factor. Manufacturing is rapidly increasing and with it the demand for electric power, but many of the electric plants still find their greatest load to be lighting. In order to encourage off-peak business special low rates have been made for power customers and now similar inducements are being offered for electric heating business.

In the Scandinavian countries, as in most of Continental Europe, steam, hot-water or hot-air furnace heating are but little used. The heating of rooms is usually done by large ornamental tile stoves that are built in and form part of each principal room. These stoves are generally designed to burn wood. The heat that the tile stoves give off is pleasant and the economy of fuel consumption is surprising. They require a minimum of care and attention. A wood fire is started in the morning and allowed to burn down to coals, whereupon all the dampers are tightly closed, confining the heated air and gases to the long winding flues that fill the interior of the stove and bringing the whole to a temperature such that it radiates no small amount of heat. The radiating surface is large, as the stoves usually extend from floor to ceiling. The heat from a single firing is retained for 12 to 15 hours. The wood is almost entirely consumed.

It has been proposed to take advantage of the heat-retaining properties of these porcelain stoves and their uniform pleasant heating effect by means of portable electric-heating elements of a new construction that may be inserted in the ordinary combustion chamber and will produce during the night sufficient heat to last throughout the following day. This would make possible the utilization of the large number of stoves already installed, representing no small amount of invested capital, and would also supply a demand for the surplus electric current available through the night. It has been suggested that the current for heating could best be supplied through a special set of mains, and that this current could be turned off at the power station at a fixed time in the morning. Should additional heat be desired during the day, the portable electric heater could be removed and the usual wood fire built.

There is a portable tile stove for electric heating on the Swedish market that is claimed to be as effective as the stoves in which fuel is burned. Its usual size is about 40 by 20 by 12 inches and has a capacity of 1.5 kilowatts. This it is claimed, will raise the temperature in a room of thirty-nine cubic yards capacity eighteen degrees Fahrenheit in one hour. After the room has been heated, the current may be reduced. It is claimed that the cost of operation on highest current requirement in Gothenburg is $0.0724 per hour, while the lower connections to which it can be switched cost $0.3752 and $0.0188, respectively, per hour.

Although the adoption of electric heating to tile stoves is regarded as the most promising development in this line, it is believed in many quarters that the introduction of electric radiators both of standard and of new designs is bound to displace many of the tile stoves. At any rate, aside from room heating, there is bound to be a good field for all kinds of industrial and domestic heating and cooking appliances.

Among the many cities that are considering the electric heating proposition are Gothenburg, Skofde and Boras, in Sweden, and Stavanger, in Norway. In the city of Boras, which has a population of about 21,000, the municipal electric system proposes special rates of 1.07 to 1.61 cents per kilowatt-hour for cooking purposes and as low as 0.54 to 0.67 cent per kilowatt-hour for heating current used during the night.

New Electrical and Mechanical Appliances

The Schweitzer Lubricating Brush for Collector Rings.

The collector rings on alternating-current machines should give much less trouble than the commutators of direct-current machines. For this reason they are very commonly neglected, as a result of which the collector surface and brushes become badly scored and worn. It is not unusual to find that a machine must be taken out of service to permit its collector rings to be turned down, brushes cleaned or renewed and the entire rigging to be put into shipshape order again.

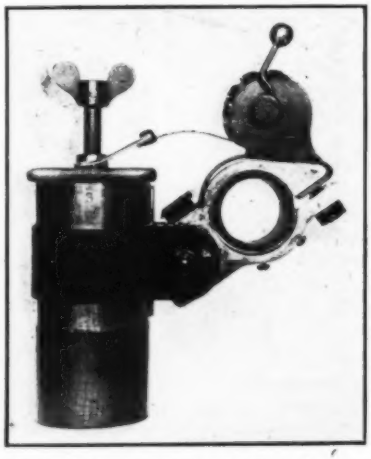
To avoid the inconvenience and cost of this procedure a special lubricating brush has been invented by E. O. Schweitzer, of Chicago. The principle upon which the brush depends is the very slow and uniform spreading over the surface of the rings of a special elastic lubricant, forced through a slot in a carbon brush.

The brush consists of a hollow brass cylinder united to a cylindrical carbon block. The cylinder, which holds a liberal supply of the lubricant, is provided with a threaded cap and a close fitting piston with screw and thumb nut. The carbon is slotted longitudinally and nearly across the face of the brush. Thus the lubricating brush supplies a steady flow of the proper lubricant sufficient to prevent wear and without gumming or fouling the collector brushes. The brush is used exclusively for the purpose, and is preferably insulated from the machine. It usually displaces one or more of the collector brushes, rendered unnecessary by the improved lubrication and increase in rating. The holder supplied with these brushes is adjustable and may be adapted to any machine. The brush is held in the holder with a close sliding fit and under moderate tension of the adjustable spring.

Lubricating Cylinder and Piston.

The elastic lubricant used is the result of much experiment and the success of this method of lubrication is largely due to the particular degrees of viscosity, volatility and adhesiveness employed. This lubricant does not gum nor readily collect dust. The amount used is small and operating cost nominal. The care of a machine equipped with these brushes is, as far as the collector rings are concerned, reduced to the turning of the thumb screw one half turn for each ten hours' running.

Under these conditions the slip rings and collector brushes readily acquire a glossy polish and wear of either is practically eliminated. The wear of the hard carbon of the lubricating brush is also negligible. The Schweitzer brush is applicable to old and badly worn rings as well as to new machines, with or without end play. It is usually mounted radially at or near the top of the machine. The Schweitzer lubricating brush is manufactured by the Chemelectric Company, 4927 Kenmore Avenue, Chicago.



The Schweitzer Brush Complete.

Light and Flatiron Combined.

An electric flatiron which also serves as a lamp has been patented by an inventor in Houston, Tex. The flatiron is made of glass and the heating element provides illumination as well as heat for ironing. The iron may also be placed upside down in a rack and used as an electric stove. The use of glass not only permits illumination from the heating unit but provides good insulation.

A Suction Gas Producer Using Crude Oil.

In districts where crude oil is readily available it has usually been employed in power production as a fuel under steam boilers. There has arisen a strong demand for an apparatus that will permit such oil to be used in connection with an internal-combustion engine, in order that the higher efficiency of the latter might be realized. To be sure, oil engines have been on the market for several years, but they require a relatively high grade of crude oil. Such engines, moreover, must be of expensive construction and it has been impossible to make them in very large sizes.

These conditions led the Wisconsin Engine Company, of Corliss, Wis., to develop a gas producer that is capable of economically forming a suitable gas from the volatile constituents of even low-grade crude oils, such as those having an asphaltic base and which are unsuitable for use directly in an oil engine. Any standard type of gas engine may be used in which the working pressures need not exceed 250 to 300 pounds per square inch, whereas in an oil engine they are practically double these values with corresponding increased temperatures.

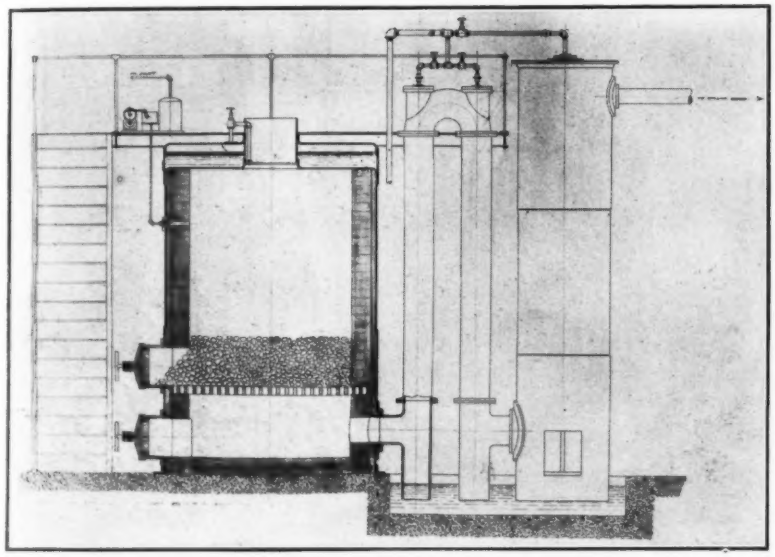
Lower Part of the Brush.

In principle the Wisconsin gas producer is somewhat akin to the producers generally used for making illuminating gas, but it is much simpler. The oil is sprayed into a combustion chamber above a glowing bed of coke to which there is but a limited supply of air. The gas formed is drawn through the fuel bed and passes through simple scrubbers to the gas engine.

By the aid of the accompanying illustration the producer may be studied more in detail. The producer itself is a plain cylindrical shell lined with fire brick and provided with a water top. Near the bottom is a fire-brick grate, on which rests a shallow bed of coke. The producer operates on the down-draft plan.

the induced draft being produced by an exhauster provided with a by-pass so that the exhauster may run at constant speed and maintain a constant pressure on the engine with a variable suction on the producer that depends on the load. The oil is sprayed into the upper zone of the producer by an apparatus which delivers the oil finely atomized and in amount exactly proportional to the instantaneous demand for power. Air and water vapor are also admitted in limited amounts automatically proportioned to the oil supplied.

Partial combustion takes place in the upper zone of the producer at a comparatively high temperature. Thereby certain of the hydrocarbons are decomposed and the carbon or soot that is set free is caught by the fuel bed acting as a large filter; this continual supply of carbon serves to maintain the bed at a practically constant level. The carbon



Suction Gas Producer Using Crude Oil.

bed also serves the further purpose of a fixing bed, so that the gases drawn off beneath it are of uniform composition.

No tar is formed at any stage of the process, the highly incandescent coke bed consuming any tarry constituents and thus eliminating the condensation of tarry vapors in the scrubbers. Practically the only impurity appearing in the gas is a fine soot, nearly all of which is caught by the spray pipes in the primary washer and a standard form of static scrubber removes what little is left. The issuing gas is clean and of remarkably uniform average composition as follows:

Constituent.	Per Cent.
CO_2	6.2
O_2	0.3
C_nH_{2n}	1.0
CO	15.1
CH_4	5.4
H_2	4.6
N_2	67.4

The average heating value of the gas is 143 British thermal units. The company guarantees at rated load eight brake horsepower per gallon of any grade of crude or residual oil higher than 10 degrees Baume in specific gravity. At maximum load a brake horsepower is obtained on approximately three-quarters of a pound of these low-grade crude oils.

Telephone-Exchange Equipment for Peak Load.

A system for transferring an incoming call from an engaged to a disengaged operator has been devised by F. Johannsen, of the Copenhagen Telephone Company. At each operator's position three of the answering cords are connected with automatic selectors, and thereby act as transfer cords. When any operator uses such a cord in attending to a call she transfers the call to a disengaged colleague, the automatic device of the selector moving along until it reaches a wire from a disengaged operator within the same group of 20 operators to which the first operator belongs. The disengaged operator answers the call at once, even if she is obliged to transfer one of her own calls in order to do so. In one of the Copenhagen stations it was found that 220 jacks could be handled at each position with the peak-load auxiliary apparatus in service just as expeditiously as 160 jacks could be handled with the purely manual equipment. The automatic selector employed in Copenhagen is of the electropneumatic type. The speed of movement is such that all 20 contacts are searched in 0.6 second. In case all contacts are engaged at one time the selector travels back and forth until it finds a disengaged contact.

APPLICATION OF LARGE SYNCHRONOUS MOTORS IN MINING.

Compressing Plant of the Amalgamated Copper Company.

Of late much attention has been given to the institution of economies in the mining of copper ore. One of the important steps towards the reducing of the cost of copper per pound has been the gradual but continual displacement of steam plants by installations of electric power. Wherever possible, direct electrification has been the rule. In places where this has not been feasible, compressed air produced by electrically driven compressors has often been used to advantage. The next step toward securing greater economy of operation has been to centralize the electrically driven compressors.

The various properties of the Amalgamated Copper Company in the Butte district of Montana probably have the largest output of copper in the world for the same extent of territory. For this reason and also because the district is comparatively limited in area, this company has led in the building of large electrically operated central compressor installations.

Particular advantages have accompanied the centralization of the air-compressor stations. Where formerly each mine ran its own compressors, there are now four large compressor stations which have displaced most of the isolated compressors formerly used; these are the Neversweat, the Leonard, the Bell, and the new central compressor plant located adjacent to the substation of the Great Falls Power Company.

The Neversweat plant is the oldest; at this point there are installed three 300-horsepower and one 800-horsepower induction motors driving air compressors. The next plant to be built, the Leonard, is equipped with two 550-horsepower and two 660-horsepower induction motors. The third plant, the Bell, has four 600-horsepower motors. Rope drive is used in the three plants named.

For the last plant, known as the central compressor plant, it was decided to increase the size of the unit over anything attempted previously, to use direct-connected drive, and to install synchronous motors. Accordingly, at this plant there are installed three 1,200-horsepower engine-type synchronous motors built on the shafts of the air compressors. Two of these motors are shown in the accompanying view. A fourth 1,200-horsepower motor is on order and two more of

the same size are to be ordered at a later date, making the ultimate capacity of the plant 7,200 horsepower.

The economies of electrification are apparent when it is considered that the cost of one horsepower per year generated in the Butte district by steam varies from $80 to $125 while for isolated electrical installations the cost per horsepower-year was reduced to from $35 to $60. By centralizing the plants further economies were effected, both on account of reduced maintenance and due to the fact that the load-factor on these centralized plants was very much better than the load-factor on individual installations, thus saving a considerable investment in motors and compressors. The use of large direct-connected synchronous motors produced still further economies by permitting a better efficiency per unit to be obtained, by reducing the cost per horsepower installed, by eliminating the loss in rope transmission, by decreasing attendance charges, and by permitting the synchronous motors to be used to correct power-factor, in return for which the power company was willing to make a considerable reduction in the cost of power. In this new central compressor plant the cost per horsepower-year will be in the neighborhood of $25.

The compressors were built by the Nordberg Manufacturing Company. They pump into a large receiver system, consisting of a considerable number of steel tanks. Constant pressure is maintained hydraulically, a huge water tank being located on a hill some distance above the receivers. By thus permitting the compressors to pump into a receiving system and causing the various machines in which the air is used to draw upon these receivers, the individual compressors operate continuously at full load and maximum efficiency, large variations in load being taken care of by starting or shutting down an entire compressor unit.

A novel method is used in starting the synchronous motors. The valve gear on the compressors is arranged with a link motion, somewhat similar in purpose to that used on a locomotive, but radically different in design. By means of this link motion, the valve gear may be reversed and by introducing compressed air from the receiver system, the compressor may be actuated as an air engine. In this way a compressor may start its synchronous motor and bring it up to the proper speed for synchronizing it with the power supply line.

A refinement has been added to the switchboard equipment furnished at this plant, by means of which the motor may be automatically connected to the supply line when it reaches the proper speed, thus eliminating the necessity of synchronizing by hand. This refinement consists of an automatic synchronizer so arranged that it operates, by means of solenoids, the main switches between the busbar and each individual motor. While this automatic feature is not always used it acts as an extra safeguard to render the station more reliable.

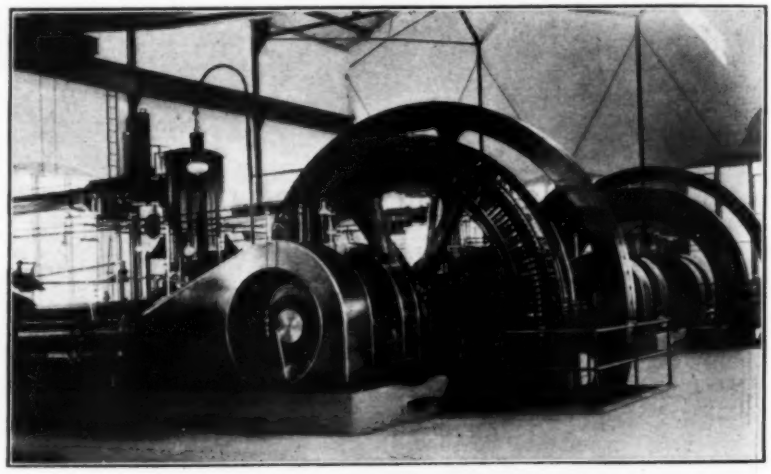
A still further safeguard is provided by having the motors designed so that, if absolutely necessary, they may be started by supplying current directly to the armature. The field is provided with a cage-type winding, which, while ordinarily used to prevent hunting, permits the motors to act as induction motors at starting. This method of starting is used only in case of emergency, when no other means of starting are available. The feature has, however, the great advantage that the plant can be started from a complete standstill, even if there is no air in the storage system.

A considerable quantity of the compressed air from this central compressor plant is used to operate large hoisting engines at the various shafts located in its immediate vicinity. The balance is used for operating pneumatic drills underground.

The hoisting engines that are now pneumatically operated were formerly operated by steam. To adapt them for air operation only a few changes were required. It has been figured that the economy in hoisting secured by the use of the compressed air in the manner here described will reduce the cost of copper approximately one-half a cent per pound, which, considering the tremendous output of the Butte mines, means an immense annual saving.

Calculations of the cost of hoisting by electricity direct, indicate that the economy of electric hoists would even be greater than that secured by the use of compressed air. On the other hand, the installation of the electric hoists would have meant the entire discarding of the present equipment, the purchase of considerable equipment that would be of no service except in connection with hoisting, and further to obtain the advantages of a strong system, such as is afforded by the receivers at the central compressor plant, motor-generator sets with large flywheels and storage batteries would have been required. For these reasons, it was not considered feasible in this particular instance, to electrify the hoists themselves, although for most installations the direct electrification of the hoists will prove more economical than the use of electrically compressed air.

On account of the importance of the mining operations in Butte, the great expense of even temporary shutdowns, and particularly on account of the compressed air being so largely used for hoisting purposes, the reliability of the apparatus to be used was given the greatest consideration by the engineers of the mining company. For a long time there was considerable doubt as to whether synchronous motors of this size could be made as reliable as induction motors. It was thought that, if there were any very large variations in load, or if unforseen circumstances disturbed the normal condition of the electric power supply, the motors might fall out of step. So when synchronous motors were finally decided upon very rigid guarantees regarding successful and continuous operation were required from the manufacturers, but the machines have more than lived up to their guarantees. Since the earily part of 1910, when the first synchronous motor was put into operation, not a single failure of any

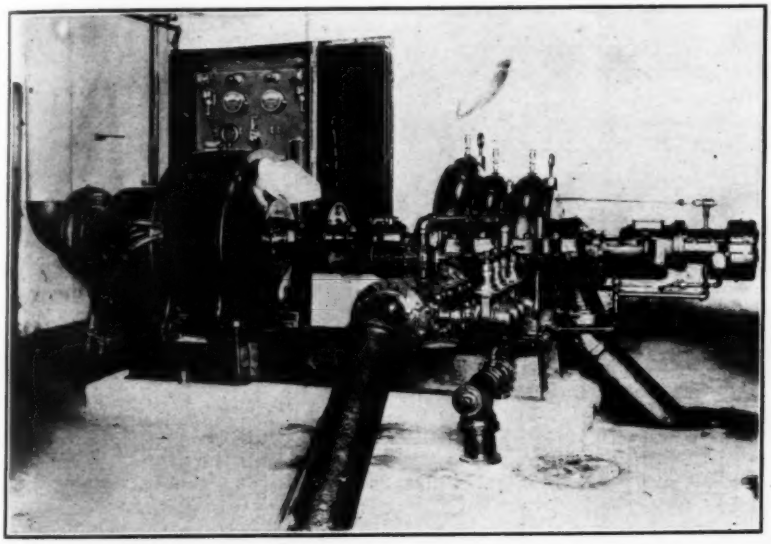


Synchronous Motors Driving Air Compressors.

sort has occurred, and although the power supply during this time has often been unsteady and there have been large variations in both voltage and load, none of the motors has ever fallen out of step nor has there been any disposition on their part to hunt. For this reason it has been recently decided to double the capacity of the original installation.

The three motors now installed and the one now in order are all three-phase, 2,400-volt, sixty-cycle machines, rated at 1,200 horsepower. They have an overload capacity permitting operation continuously at 25 per cent overload and 50 per cent overload for one hour. On account of the slow speed required, due to their being direct-connected to large compressors, they have ninety-six poles, giving a speed of seventy-five revolutions per minute. They were built by the Westinghouse Electric & Manufacturing Company. The dimensions are probably larger than any other synchronous motors every built for this class of service.

The electrical energy used is generated on the Missouri River by the Great Falls Power Company and transmitted approximately 100 miles under a pressure of 110,000 volts to the point at which these motors are installed.



Motor-Driven Fire Pump.

Motor-Driven Pumps for Fire Service.

In manufacturing plants where a fire is liable to be especially disastrous to both life and property, fire protection is of great importance, not only to save direct fire loss, but also in some cases to comply with regulations of municipalities and in others to reduce the cost of insurance. Plants in which clothing is manufactured belong to this class, and the more progressive manufacturers are not slow to employ the most modern systems of fire protection known.

Hart, Shaffner & Marx, the well known Chicago clothing manufacturers, own a large building which is protected by an automatic sprinkling system of a very modern and reliable type.

The sprinkling system extends throughout the building. Pressure in the pipes is maintained by a 2,000-gallon compression surge tank, which is normally half full of air at 150 pounds pressure and acts as a cushion for the system.

Water is kept in the surge tank under a pressure of not less than 140 pounds by a motor operated pump, shown in the accompanying illustration. The pump's capacity is 1,000 gallons per minute at 150 pounds per square inch pressure in excess of the supply pressure in the city main which is about 25 pounds. The motor starts the pump automatically when the pressure drops to 140 pounds. The air cushion tends to compensate for light leakage, so that practically constant pressure is maintained; frequent starting of the motor to replace small losses is therefore avoided. Under present conditions the outfit operates once in about every ten days and runs but a few seconds until full pressure is restored in the tank.

The entire installation is provided with telegraphic indicators. One shows the exact height of the water level in the air-cushion tank; another whether the pressure on any part of the system drops below the cut-in pressure of the pump; another tells whether the voltage is cut off from the control panel outside or at the switchboard. All main valves are provided with alarms which sound when the valves are closed.

The pump is of the horizontal three-stage pattern, built by the Jeanesville Iron Works Company. Besides keeping up the pressure in the surge tank, the pump feeds a stand-pipe service, so that hose connections may be made at several points on each floor in case of fire. A gravity roof tank of 40,000 gallons capacity is used as an auxiliary to the pump in feeding the sprinklers should anything happen to the motor, pump or control.

This roof tank, however, is not connected to the standpipe system. The latter has to rely on regular steam fire engines in case of failure of the electric pump. The pump is so constructed that it is impossible to overload the motor in case of excessive water flow such as would be occasioned by the bursting of one or more hose lines.

The motor is built in accordance with the requirements of the Chicago Board of Fire Underwriters, which specify the following:

The motor must be entirely inclosed and provided with a ventilating blower on the end of the shaft. The air intake must lead to an adjoining room so as to insure cool air being furnished to the motor. It must also be waterproof. The air outlet pipe must be turned down so as to prevent falling water from entering the motor casing.

The motor frame must be waterproof up to its center line and all covers provided with rubber gaskets to keep out falling water in the event of the bursting of a hose line or other accidental flow of water in the engine room.

The leads must be brought out above the center line so that they will not be damaged by water until it gets up to the shaft. With continuous operation at full load the rise of temperature in the motor must not exceed 40 degrees.

The motor is of Westinghouse make, direct current, 150 horsepower, 1,400 revolutions per minute, 220-volt, and designed especially for service of this kind.

The control, which was furnished by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., is automatic, although it is arranged for hand operation in case of emergency.

The installation described reduced the insurance premium on the building approximately one-half.

Copper Exports.

Exports of copper for the month of January were 30,967 tons as compared with 29,257 for January, 1911.

Exports of copper for the week ended February 1 were 9,282 tons, since February 1, 2,406 tons; in the same period last year the exports were 3,638 tons.

Telephone System for Taxicab Company.

A new electrical telephone system which in many respects is similar to that of the Gamewell police and fire box and the trolley-pole call system, has just been installed in Pittsburgh by the American Telephone & Telegraph Company on behalf of the Pittsburgh Taxicab Company.

This is said to be the first installation for the purpose in any American city. Telephone equipments in iron boxes have been placed on telephone poles in all sections of the city, all connected with the private exchange of the taxicab company.

The Pittsburgh Taxicab Company finds that half the travel consists of empty hauls or dead mileage. The problem has been how to reduce or possibly eliminate this dead mileage. Under the usual method of operation it developed that cabs would return empty from points three and four miles removed from the central depot, and that at the same time another car had been dispatched to the same vicinity, empty, to pick up a passenger. In other words, two empty cabs would be passing one another in making wasted mileage when both might have been doing profitable service at a great saving in operation cost.

As a result, arrangements were made by which the telephone company has installed the system and it is already proposed to extend the system to all outlying suburban points. Drivers of the taxicabs have been equipped with keys to these special telephone boxes and as soon as they are dismissed at the end of the trip, report immediately by telephone, instead of driving miles to report in person. Upon reporting the drivers are given their instructions over the wire, often at the saving of much time and tire wear. The taxicab company is authority for the statement that it is able to handle 25 per cent more calls during busy hours with the same equipment than previously.

Party-Line Privacy.

A means of obtaining privacy for each subscriber on a party-line telephone system has been developed in Germany. The principal feature is a switching relay so constructed as to be actuated by direct current but not by alternating current. When the subscriber lifts his receiver he not only calls the exchange but at the same time operates electromagnets which cut out the other subscribers on the line. Selective ringing is used for incoming calls and again as soon as the receiver is lifted the other instruments on the line are cut out.

Conversation between subscribers on the same party line is the most difficult operation, but it has also been arranged for.

The Dictograph.

The Dictograph is a form of telephone system which consists of a master station and any number of substations, communication with any one of which may be established by operating keys at the master station. The arrangement of the master station is shown in Fig. 1. An ordinary receiver may be used, or it may be replaced by a loud-speaking receiver with horn which enables a number of persons to hear at the same time.

The transmitter is quite different from the ordinary microphone, and is illustrated in Fig. 2. The rubber case which incloses it is so constructed as to act as a magnifier of the sound, since it reflects waves coming to it from every direction so as to concentrate them upon the sensitive diaphragm.

This apparatus is the invention of

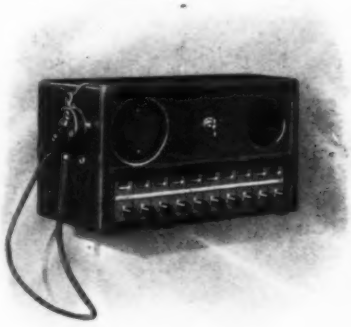


Fig. 1.—Dictograph Master Station.

K. M. Turner, 1265 Broadway, New York, N. Y., and is a modification of the acousticon, which has come into wide use to assist the hearing of deaf persons. It was found that with some modifications the transmitter would operate a loud-speaking receiver, the sensitiveness of the transmitter being such that it may be spoken into at a distance of several feet.

Each master station is equipped with a loud speaker, while the substations have the ordinary receiver. The master station may be placed in the office of an executive while his associates or subordinates use substations. Each subordinate may thus talk to the manager and if the latter connects with several at the same time persons on the different lines may all talk together. The manager may dictate to one of his subordinates without the necessity of holding a transmitter or receiver. If a conference is being held in the manager's room any subordinate may speak so that all will hear him. Thus time can be saved in sending for assistants, and reports can be obtained or short communications held.

Interconnecting master stations may be installed where there is more than one executive officer. By this method managers of departments are able to converse with each other or communicate with subordinates. The master station measures 11.75 by 6.75 by 6.25 inches, and may be attached to the desk by a folding bracket or placed in a permanent position upon the top. The substations measure 4.25 by 5.5 by 3.12 inches.

More recently a transmitter was designed with modifications for the use of detectives as an eavesdropper. The transmitter is hidden somewhere in the room and a person holding a receiver in another room can overhear everything that is said in the room where the transmitter is hidden. This

Fig. 2.—Dictograph Transmitter.

use of the dictograph has been instrumental is securing convictions in a number of criminal cases.

Seagumite.

A London chemist, John S. Campbell, has developed a new insulating material, known as seagumite, from ordinary seaweed. The new product is acid-proof, damp-proof, uninflammable, flexible and cheap. It is unaffected by heat, cold, oil or exposure to the weather.

Tests carried out at the Westminster Electrical Testing Laboratories and reported in the *Electrical Engineer* show the insulation resistance to be very high, and it was actually increased after immersion in water to about 30,000,000 megohm-centimeters. The surface leakage was quite small. Both were improved by baking. Samples one millimeter thick were tested for electric strength with alternating voltage. Puncture ensued between 9000 and 16,000 volts.

Electric Storage Battery Company Gives Dinner to Electric Vehicle Manufacturers.

Good fellowship was the keynote of the fourth annual dinner tendered by the Electric Storage Battery Company, of Philadelphia, to the manufacturers of electric automobiles at the Blackstone Hotel, Chicago, February 1. These dinners, which have become to be considered by the manufacturers as an annual feature of the Chicago Automobile Show, are unique inasmuch as there are no speeches beyond an address of welcome by Herbert Lloyd, president of the company. After the dinner the guests, eighty-five in number, were entertained by a vaudeville show.

Mr. Lloyd, as host, was assisted by Charles Blizzard, vice-president of the company, and the managers of the Chicago, Cleveland, Detroit, St. Louis and Atlanta offices.

Representatives of the following companies using Exide and Ironclad-Exide batteries were in attendance:

Argo Electric Vehicle Company, Baker Motor Vehicle Company, Borland-Grannis Company, Broc Electric Vehicle Company, Champion Wagon Company, Columbia Motor Car Company, Columbus Buggy Company, Commercial Truck Company of America, Dayton Electric Car Company, General Vehicle Company, Grinnell Electric Car Company, Hupp-Corporation, Kentucky Wagon Manufacturing Company, C. P. Kimball & Company, Ohio Electric Car Company, Rauch & Lang Carriage Company, Standard Electric Car Company, Studebaker Automobile Company, The Waverley Company, Walker Vehicle Company, Ward Motor Vehicle Company, Woods Motor Vehicle Company.

Electric Trucks at Chicago Show.

The second week of the Chicago Automobile Show was devoted exclusively to commercial cars and accessories, the pleasure-car show ending February 3. As was the case last week, every available foot of space was taken and several manufacturers were forced to show their products outside the building.

The exhibits of accessory manufacturers remained practically unchanged during the two weeks. Mention of these exhibits of interest to electrical men was given in our last issue. Among the manufacturers of commercial cars, the following exhibited electric vehicles:

Anderson Electric Car Company, Detroit, Mich., showed two "Detroit" 1,000-pound delivery wagons with different style bodies, and a chassis of a 2,000-pound vehicle showing the arrangement of batteries.

Baker Motor Vehicle Company, Cleveland, O., exhibited a 1,000-pound delivery wagon and a two-ton truck; also the chassis of a 2,000-pound vehicle.

General Motors Company, Detroit, Mich., showed a 1.5-ton chassis with express and 'bus bodies, a five-ton brewery truck and a five-ton chassis.

General Vehicle Company, Long Island City, N. Y., exhibited one 1,000-pound delivery wagon with closed body and a 7,000-pound truck; photographs of prominent installations were also shown.

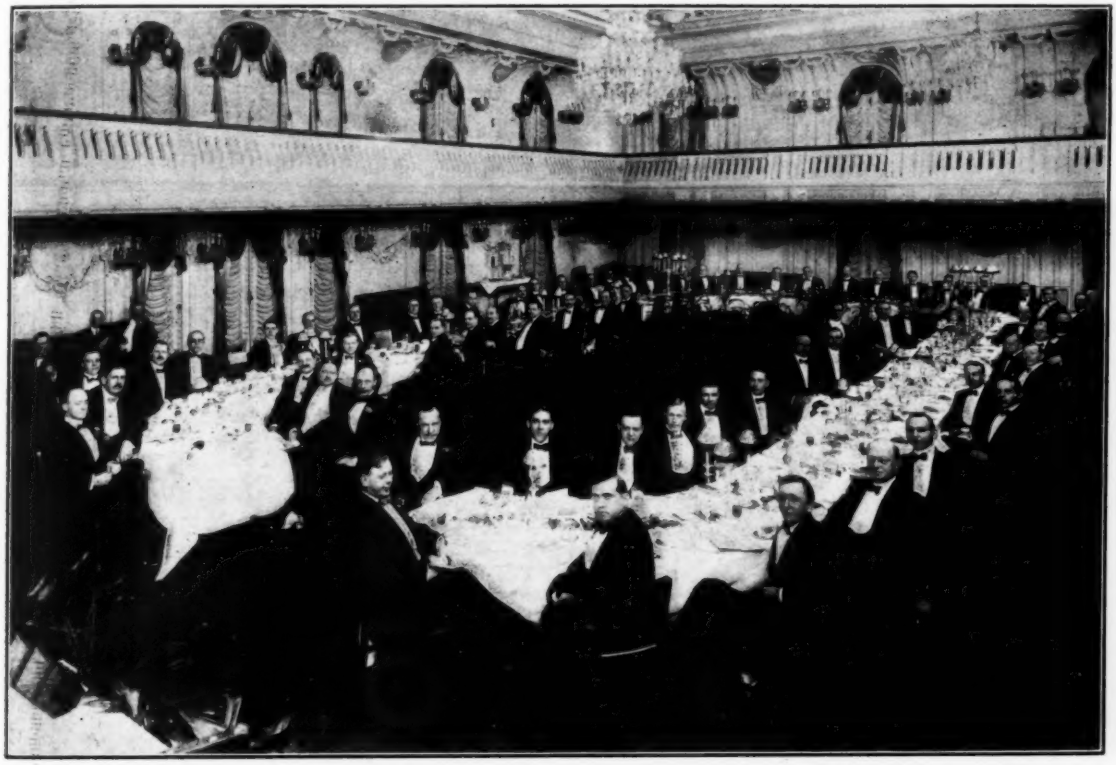
Lansden Company, Newark, N. J., had on exhibition a 1,000-pound wagon with express body, and a 1.5-ton truck.

Walker Vehicle Company, Chicago, Ill., showed one 750-pound delivery wagon and chassis, one 1,000-pound vehicle and one one-ton chassis; also a section of a wheel showing method of driving.

Waverley Company, Indianapolis, Ind., had on exhibition two 1,000-pound delivery wagons and a 2,000-pound truck and chassis.

New English Wiring System.

The Milne electric-wiring system has just been demonstrated in London by Foote and Milne, Limited. In the main it consists of a steel casing containing bare copper wires. A steel-strip sole plate corrugated at the middle is screwed to the wall and a steel-trough cover is secured to the sole plate by tee-headed bolts, whose tees fit into the corrugation. These bolts are four feet apart and over them are placed porcelain insulators into which, by bending, the wires are connected and tightened. For making joints in the conductors, porcelain-covered couplings are used. Continuity of the earthing shield is a point of the system to be noted. The Milne system is chiefly intended for factories, workshops and offices.



Guests at Fourth Annual Electric Storage Battery Company Dinner to Vehicle Manufacturers.

Electrical Equipment for the Los Angeles Aqueduct Hydroelectric Project.

The city of Los Angeles, Cal., has recently approved a bond issue amounting to $357,367 to complete the equipment of the hydroelectric project to be operated in connection with the 250-mile aqueduct by which the city water is brought from Owens Lake near the Yosemite National Park.

The generating equipment will be installed at power house No. 1, located at San Franciscedo, 47 miles from Los Angeles to which point current is to be sent at 60,000 volts.

In the power house there will be installed three 9,375-kilowatt, 6,600-volt, 50-cycle, three-phase, water-wheel generators running at 200 revolutions per minute and two 250-kilowatt, 250-volt direct-current water-wheel generators used as exciters. There have been ordered ten 3,150-kilowatt, single-phase, oil-insulated, water-cooled transformers for raising the generator voltage to that of the transmission line.

In the substation there will be installed nine 5,000-kilovolt-ampere, single-phase, oil-insulated, water-cooled transformers for stepping down the transmission voltage to either 33,000 or 16,000 for secondary distribution.

The contract for the entire electrical equipment was awarded to the Westinghouse Electric & Manufacturing Company. Delivery of all this apparatus must be completed by next November.

The Peel-Conner System of Telephony.

The new Avenue telephone exchange in London has been equipped by the Peel-Conner Telephone Works, Limited, of Salford and London, on a new plan. The peculiar characteristics of the new method, which is known as the ancillary-jack system, consists in the fact that each call from a subscriber is notified to three operators instead of to one only, and any one of these can respond, so that the opportunities for "getting through" quickly are tripled. This result is achieved in the following manner. Each subscriber's circuit is equipped with three (instead of one) call lamps and answering jacks located at widely separated points on the switchboard. One of the three jacks is the primary and the other two are ancillary, being secondary and tertiary respectively. The primary jack corresponds to the single jack of the ordinary system and the call is normally responded to by the operator in whose position the jack occurs in the primary section. If this operator is busy and the operator at the position where the jack comes in the secondary set is disengaged, the latter operator responds; and similarly with the tertiary section. The second and third operators, acting under their instructions, will wait long enough to give time for the primary jack to be used, and then if it is not brought into action, one of the ancillaries will be employed. When two lamps glow simultaneously in front of a disengaged operator, one a primary and the other an ancillary, she will answer the call of the primary lamp in preference to the other. The triple sets of jacks and lamps are arranged in parallel, and the insertion of the answering plug in any one of the three jacks extinguishes all three lamps. But if two, or even all three, were coupled up simultaneously no harm would result. Not only should this system lead to a more prompt response to calls, but the distribution of the traffic should be rendered more even and the work of the operators made more uniform. At night and during other slack times the work can be concentrated on one-third of the switchboard, the ancillary jacks and lamps in the section used being treated as primaries.—*Mechanical Engineer.*

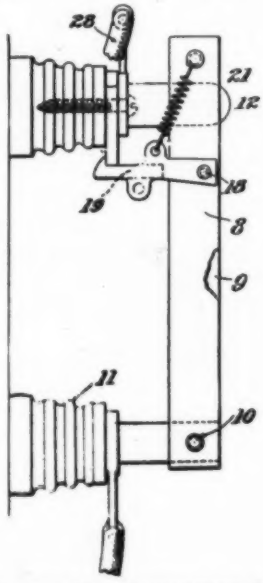


Fig. 1.—Condit Disconnecting Switch.

Magnetically Locked Disconnecting Switch.

The ordinary knife-blade disconnecting switch intended for isolating apparatus from a high-tension line has often given trouble from automatically opening while extra heavy currents were passing, such as those due to a short-circuit, sudden surge or excessive overload. The resulting arc has usually destroyed the switch, which is designed for being opened only when the line is dead. To prevent such switches from being opened by heavy currents or by unauthorized individuals, Sears B. Condit, Jr., of Boston, Mass., has invented a magnetic lock for which a patent was issued January 9.

From the two accompanying diagrams the principle of the Condit switch may be readily understood. Fig. 1 is a side elevation of the switch, while Fig. 2 is a perspective of its upper portion, showing the locking device. The switch is shown as having double knife blades *8* and *9*, which engage the switch clips *12* that are mounted on the terminal clip *13*. Between the latter and the insulator is mounted a wrought-iron horseshoe magnet *14* whose poles *16* engage the iron latch *17*, *19*, which is pivoted at *18* and acts as an armature for the magnet. As long as current is passing, the magnetic latch is energized and the more strongly as the current increases in value. To prevent the latch from dropping when no current is passing but while the line is still live, a spring *21* is provided as an auxiliary. The latch may be opened by inserting a hook in the hole *20*.

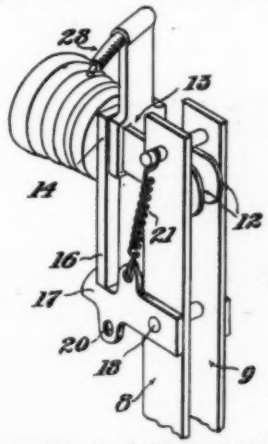


Fig. 2.—Detail of Magnetic Lock.

A German Gasoline-Electric Car.

A gasoline-electric motor car which has recently been built for the Prussian State Railways, is the first of its type on those lines. The car body is supported on two two-axle trucks, is 53.8 feet in length, and has accommodation for 95 passengers. The petrol motor has four cylinders giving an output of 120 horsepower at 700 revolutions per minute, and at no load is provided with a device enabling it to run at 250 revolutions per minute. The main shaft is coupled to a shunt-wound dynamo of 66-kilowatt output at 700 revolutions per minute, 220 amperes and 300 volts, but capable of being driven at 580 amperes for 30 seconds. The exciting current is supplied by a 2.5-kilowatt generator mounted on an extension of the dynamo shaft. The coach is driven by two 82-horsepower motors running at 600 revolutions per minute, so geared that the coach may run up to 40 miles an hour.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

SANTA ROSA, CAL.—Bids will be received up to February 20 for lighting the city.

MOVILLE, IOWA.—Edward Metcalfe contemplates building an electric light plant here. C.

DULUTH, MINN.—Residents of New Duluth want twenty-five additional arc lights. C.

NASHUA, N. H.—The merchants of Factory Street are forming plans for a "White Way."

GARRETSON, S. D.—The city is planning for the establishment of an electric light plant.

ALPINE, TEX.—The Alpine Light & Power Company will make improvements to its plant. D.

MOVILLE, IOWA.—Edgar Metcalfe contemplates putting in an electric light plant here.

MITCHELL, S. D.—The council is discussing the lighting of Main Street with boulevard lights. C.

KERKHOVEN, MINN.—The citizens will raise $8,000 by subscription for an electric-light plant. C.

HASTINGS, NEB.—The Commercial Club is considering installing Corinthian column cluster lights. C.

MISSOULA, MONT.—The council has ordered a new lighting district, to be equipped with curb cluster lights. C.

DALLAS, TEX.—The city of Dallas will shortly ask for bids for illuminating Main and Commerce Streets.

STILLWATER, MINN.—There is some talk of taking up curb-line cluster lighting for the downtown district.

MITCHELLVILLE, IOWA.—G. T. Gibson has been granted a franchise to install Electric lighting in Mitchellville.

ATCHISON, KANS.—The city of Atchison is formulating plans for the installation of a municipal lighting plant.

SAINT PETER, MINN.—The town is contemplating the installation of a new street-lighting system in the near future.

GERVAIS, ORE.—The city contemplates the installation of an electric lighting system. The Board of City Trustees is interested. A.

ROCKWOOD, WASH.—The Spokane, Washington, Improvement Company will install an electrolier street-lighting system in Rockwood.

PARIS, IDAHO.—The Tollurido Power Company has been granted the right to maintain an electric light and transmission system in this city.

MULDROW, OKLA.—The city has voted bonds for the construction of an electric transmission line from Fort Smith, Ark.

MINNEAPOLIS, MINN.—The Council Committee has announced a plan to add about 300 electric street lamps to the city street-lighting system this year.

PORTLAND, ORE.—The Oregon-Idaho Light & Power Company has been granted a franchise for an electric plant, power and heating service.

FRESNO, CAL.—The San Joaquin Light & Power Company contemplates the construction of a new power line between Big Creek and Los Angeles, Cal. A.

OMAHA, NEB.—City Electrician Michaelsen has submitted plans to the City Council for a new downtown lighting system of flaming arcs, 123 in number. C.

WASHINGTON, IOWA.—F. S. Donnell of Santa Fe, N. M., is interested in the proposition to construct a dam for generating power on the Skunk River. C.

COLORADO SPRINGS, COLO.—The Manitou Hot Iron Club is working for the installation of a splendid lighting system between Colorado Springs and Manitou.

BELLINGHAM, WASH.—Smith, Kerry and Chase, Toronto, Canada, contemplate the erection of a power plant at Bellingham. Modern equipment will be installed. A.

HUNTINGTON, ORE.—The City Council has granted a franchise to the Oregon-Idaho Light & Power Company for an electric light plant, power and heating service.

PHILADELPHIA, PA.—The Sanson Street Business Men's Association is planning for the erection of illuminated arches across Sanson Street at Seventh and Eighth Streets.

WESTON, ORE.—The Preston-Shaffer Milling Company, Athena, Ore., it is understood, is planning the reconstruction of its electric lighting plant. The plant will be fully equipped. A.

ALBUQUERQUE, N. M.—The Federal Light & Traction Company is contemplating the extension of its transmission system north and east to accommodate the pumping plants.

WICHITA FALLS, TEX.—The Citizens Light & Power Company has been formed here with a capital stock of $21,000. The incorporators are T. E. Dobson, I. W. Gullahorn and Sam Levi. D.

EL PASO, TEX.—The El Paso Light & Power Company has been incorporated with a capital stock of $10,000. The incorporators are Mermas Gray, Elmer H. Gray and Hannah M. Gray.

FLOODWOOD, MINN.—M. W. Hingeley, A. H. Markkansen, E. B. Robinson and James Markell were appointed a committee to obtain estimates on the cost of installing a light plant. C.

LEWISTOWN, MONT.—The Butte Electric & Power Company will build a high-tension line from Great Falls to this city. Work will be started about July 1 and completed in November. C.

BEVIER, MO.—The Electric Light & Power Company of Bevier has been incorporated with a capital stock of $10,000. The incorporators are J. W. Nisbeth, D. D. Rowland and W. R. Morgan. Z.

LAWRENCEBURG, IND.—Jacob M. Bauer and a number of manufacturers are planning to build and equip an electric light and water-works plant in Greendale, a prosperous suburb of this city. S.

FAYETTESVILLE, N. C.—The Louisville & Interurban Railroad Company has authorized the announcement that it will build a new power house in the near future at an estimated cost of over $300,000.

NEW CASTLE, IND.—The municipal water and lighting system is to have extensive improvements including two generators, condensers, air pumps, etc. Mr. Brosman has been retained as consulting engineer.

LEWISTOWN, MONT.—The Citizens Electric Company has announced that the plans for building a high-tension line from Great Falls to Lewistown have all been worked out and that work will be started next summer.

HARRISBURG, PA.—The Water Supply Commission has under consideration plans for the erection of three dams on the Clarion River at an estimated cost of $10,000,000, for the purpose of furnishing power to Pittsburgh.

MATHERSVILLE, ILL.—The Mathersville Light & Power Company has been incorporated with a capital stock of $10,000. Paul Wagner, J. W. Walsh, John J. Ryan, H. C. Lightner and W. W. McCullough are the incorporators.

FORT STOCKTON, TEX.—H. H. Butz and J. M. Odom have purchased the franchise for the electric light plant here from Schraff & Zarbock. The new owners will complete the installation of the plant and install an ice factory. D.

BELLINGHAM, WASH.—An appropriation of $6,000 from the funds of the water department has been made for the installation of the required equipment for the auxiliary electric lighting plant which the city proposes to build.

OXNARD, CAL.—Engineers Olmsted & Gillellen, Los Angeles, have in charge the matter of a municipal water and lighting system for Oxnard. According to the plans a bond election will probably be called and funds raised

for a new mission style water plant, etc.

SAND SPRINGS, OKLA.—The Sand Springs Power, Light & Water Company has been incorporated with a capital stock of $25,000. Charles Page, C. F. Tingley, George W. Kinney and C. W. Kingsbury, Tulsa; Edwin A. Page, Sand Springs, are the incorporators.

MADISON, IND.—The Madison Light & Fuel Company has been incorporated with a capitalization of $150,000. The company will manufacture electricity for light and power purposes to be furnished the citizens of Madison and vicinity. Earl F. Potter, Milard C. Bevine and Henry L. Hanley are the incorporators. S.

GARRETT, IND.—The City Council is asking for bids for furnishing a steam-engine-driven generator unit of 150 kilovolt-ampere capacity, 200 revolutions per minute, three-phase, 2,300 volts, 60 cycles, with the necessary exciter, switchboard and other equipment for the city light plant. W. W. Mountz is city clerk. S.

TAMPICO, MEX.—The two electric light plants and the street railway line here have been merged into one ownership. It is stated that an entirely new power plant will be installed and that the Tampico Electric Company will convert the street-car line into an electric traction line to La Barra and a number of other near-by towns. D.

NORMAN, OKLA.—The Norman Electric Light & Power Company is asking a franchise from the city council at Norman for 21 years, for the purpose of building an electric light plant and an electric street railway. The Norman men interested are J. C. Jonas, M. J. T. Capshaw and R. C. Hardie, who claim to have the backing of eastern capital.

ATLANTA, GA.—The Central Georgia Transmission Company, of Macon, recently filed application with the Railroad Commission for permission to issue $2,000,000 common capital stock and $2,500,000 in bonds, for the purpose of raising funds with which to build transmission lines from Griffin to Atlanta and erect substations at various points in and around the city of Atlanta.

PACHUCA, MEX.—The Pachuca Light, Power & Railway Company is preparing to construct an irrigation system that will afford a water supply for more than 50,000 acres of land in the territory around Tula, Actopan and Ixmiquilpan. The company has adopted plans for the construction of a dam that will form a reservoir of a capacity of 75,000,000 cubic meters of water. The main canal will be about 62 miles long. D.

CANTONSVILLE, MD.—The County Commissioners of Baltimore County, Towson, Md., are asking for sealed proposals for street lighting with arc and incandescent lamps for Cantonsville and vicinity, to be received until noon of February 14. The bids must be for all-night and every-night service and cover a period of two, three and five years. About 75 arc lamps, 300 twenty-five-candlepower lamps and 105 thirty-two-candlepower lamps will be needed.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

HIBBING, MINN.—The Gulf River Telephone Company has been organized by G. A. King and others.

EUREKA, MONT.—The Eureka Mutual Telephone Company has been granted a franchise to operate through this county. C.

ASHLAND, WIS.—The Wisconsin Telephone Company will build a line between here and Rhinelander this summer.

GLASGOW, MONT.—The exchange of the Moore Telephone Company, destroyed by fire some months ago, will be rebuilt. A.

SPRINGFIELD, O.—The Tobin Telephone Company has been incorporated by John Tobin, M. B. Hardin and H. S. Fenwick.

SANGER, CAL.—Bids will be received up to March 7 for the sale of a 25-year franchise for a telephone system in this city.

WINTERS, TEX.—The Independent Telephone Company will increase its capital stock from $15,000 to $50,000 and extend the system.

FRESNO, CAL.—H. E. Bigelow and associates are contemplating the construction of a telephone line from Clovis to North Fork, Cal. A.

WEYBURN, SASKATCHEWAN. — The provincial government will construct a new central telephone exchange here this spring, with a board to accommodate 1,000 persons.

CLATSKANIE, ORE.—The Clatskanie Telephone Company will soon commence the erection of a new exchange building; extensive improvements will be made in its system. A.

HUMBOLDT, TENN.—The Gibson County Telephone Company has increased its capital stock from $5,000 to $10,000. It is expected that an exchange will be established here.

YEAMAN, KY.—The Yeaman Mutual Telephone Company has been incorporated with a capital stock of $1,000. W. T. Hopper, J. C. Green and A. T. Land are the incorporators.

ELLENSBURG, WASH.—The Reecer Creen Telephone Company has been incorporated with a capital stock of $1,000. W. W. Spurling and S. Kreidel are named among the incorporators.

MILWAUKEE, WIS.—The Wisconsin Telephone Company plans to spend $100,000 on improvements in this city this year, and over $800,000 more will be spent in other portions of the state.

ADEL, IOWA.—The Colfax Center Mutual Telephone Company has been incorporated with a capital stock of $3,000. J. F. McMullen, N. J. McGinnis and L. W. Huffman are the incorporators.

FORT WORTH, TEX.—The Southwestern Telegraph & Telephone Company has announced that it will extend the telephone service to Seminary Hill and other parts of the south suburbs.

GOLDTHWAITE, TEX.—The Brown Telegraph & Telephone Company has been formed here with a capital stock of $15,000. The incorporators are M. L. Brown, C. P. Mohler, E. D. Brailey and others. D.

KINSMAN, O.—The Kinsman Telephone Company has been incorporated with a capital stock of $8,000. L. Mathews, W. D. Lossee, P. W. Morford, A. P. Webber and F. G. Webber are the incorporators.

PATTERSON, CAL.—A. O. Blomgren, treasurer, of the Patterson Farmers' Association, has been appointed a committee of one to immediately investigate the feasibility of building a farmers' telephone line.

KINSMAN, OHIO.—The Kinsman Telephone Company has been incorporated with a capital stock of $8,000. The incorporators are L. E. Mathews, W. D. Lessee, P. W. Morford, A. P. Webber and F. G. Webber. Z.

MEDICAL LAKE, WASH.—The Pacific States Telephone & Telegraph Company is negotiating for the purchase of the Medical Lake Telephone Company. The company plans to make extensive improvements in the system. A.

NASHVILLE, TENN.—The James County Telephone Company has been incorporated with a capital stock of $2,000. The incorporators are O. G. Hughes, Hunter Furches, F. G. Tallant, W. J. Newton and G. R. Lewis.

SAN JOSE, CAL.—The Saratoga Telephone Company has filed articles of incorporation with a capital stock of $900. The directors are A. B. Brolly, Fred J. Courrier, R. L. Hogg, J. A. Kerr, L. J. Church, R. A. Husted and H. E. Brandenburg.

SPRINGFIELD, OHIO.—The International Automatic Telephone Company has been incorporated with a capital seock of $3,000. The incorporators are William H. Bruce, Jr., Finley O. Cummings, Helen C. Bruce, Henry C. Wiseman and Paul C. Martin. Z.

KNOX, IND.—The Winona Telephone Company has increased its capital stock from $65,000 to $100,000. Part of the increased capital is to be used in making improvements and extensions. Samuel Tomlinson is president and W. A. Daniel secretary. S.

HEBER CITY, UTAH.—The Center Creek & Daniel Telephone Company has filed articles of incorporation with the Secretary of State with a capital stock of $2,000. The officers are G. Frank Ryan, president; Eli Swain, vice-president; O. G. Olsen, secretary-treasurer.

BICKNELL, IND.—The Home Telephone Company has been incorporated with a capital stock of $12,000. The company proposes to build lines and maintain exchanges in Bicknell, and also in Gibson County. Charles A. Phillippe, William T. S. Mason, John L. Hutchens, Elliott T. Cox and George Holmes are directors. S.

SAN ANGELO, TEX.—The San Angelo Telephone Company is preparing to extend its long-distance lines in two directions and to install several exchanges in the territory that these extensions will open up. One extension will be west along the main line of the Kansas City, Mexico & Orient, and the other south along the branch line of that road to Del Rio. D.

ZWINGLE, IOWA.—The Zwingle Telephone Company has filed articles of incorporation with the County Recorder. The capital stock of the company is $2,000. The incorporators are John P. Biggins, D. W. Leffert and Jacob Kemerer. The company will conduct, operate and maintain for rentals a telephone system at Zwingle and surrounding towns.

ELECTRIC RAILWAYS.

(Special Correspondence.)

PORTLAND, ORE.—The Oregon Electric Railway Company is contemplating the building of a branch line to Corvallis, Ore. A.

NAPPANEE, IND.—There is a project on foot to build an interurban railway between Nappanee and Wawasee Lake.

SANTA ANA, CAL.—The Pacific Electric Railway Company will soon commence the extension of its Santa Ana line to Orange. A.

PITTSFIELD, MASS.—The Berkshire Street Railway is preparing to make various additions to its line in the Pittsfield District.

IROBVILLE, O.—A plan is being evolved for the building of an interurban line from this place to Bono, through Momineetown. H.

SALT LAKE CITY, UTAH.—The Salt Lake & Ogden Electric Railway Company plans to double-track its line from Salt Lake City to Ogden. A.

UXBRIDGE, MASS.—The Milford & Uxbridge Street Railway Company is contemplating an extension of its line to East Douglas and Manchaug.

WHEELERSBURG, O.—It is reported on good authority that the Portsmouth Street Railway & Light Company is going to extend its line to Wheelersburg.

LEBANON, ORE.—The Oregon Electric Railway Company contemplates the construction of a line from Lebanon to Foster. E. S. Clark is engineer for the company. A.

NEWBURG, ORE.—The Southern Pacific Railroad Company and the Oregon Electric Railway Company have been granted a franchise to build an electric line on First Street. A.

SAN FRANCISCO, CAL.—The Oakland, Antioch & Eastern Railway Company plans for the construction of a line from Oakland to Sacramento, and from Oakland to Stockton. A.

WHITEWRIGHT, TEX.—$40,000 worth of stock has been subscribed to build an interurban railroad from Greenville via Blue Ridge to this city. A. R. Nicholson is the promoter.

STERING, ILL.—It is proposed to run an electric road from Sterling north through Coleta, Milledgeville and Lanark to Mount Carroll. William Osborne, of Chicago, is the promoter.

LAGRANGE, GA.—The Chamber of Commerce officials have a plan under way for an electric interurban railway in Troup County. It is probable that the line will be built first as a local electric line in this city.

MEXICO, CITY, MEX.—F. S. Pearson, head of the light and power company and of the railway lines, is interested in the project of extending the street car system to Ixtapalapa, and putting in electric service to Tlanapantla.

LOUISVILLE, KY.—The Louisville Railway Company, purchaser of the ordinance grant to build and operate a cross-town line south of Broadway via Oak and Kentucky Streets, expects to have the line in operation early in 1913.

ALBERT LEA, MINN.—Preliminary surveys have been completed and the right of way for the proposed Albert Lea-Sioux Falls interurban secured. Work will be started early in the spring on the grading and construction. C.

GEISTOWN, PA.—President DuPont, of the Johnstown Traction Company, has given absolute assurance that as soon as the right of way has been secured work will commence on the trolley extension from Walnut Grove to Geistown.

MINOT, N. D.—Following the rejection of the city railway franchise by the city commissioners, covering only the downtown districts, it is stated that later another franchise will be made for a franchise which will cover the entire city. C.

NEW HAVEN, N. Y.—The New Haven Railroad will electrify about 41 miles of railroad as soon as weather permits, according to an announcement recently made by President Mullen. The plan is to have the electric zone extend from Stamford to New Haven.

YOUNGSTOWN, O.—The Youngstown & Southern, which operates between Leetonia and Youngstown, will build another electric line in this territory as soon as spring opens. The territory of the new line is located east of Columbiana and will take in New Waterford and East Palestine.

MINNEAPOLIS, MINN.—The Twin City Rapid Transit Company will extend the Johnson Street line to a point where it will connect with the Kenwood and Eighth Street S. E. line. Another extension to be made is that of the Cedar and Camden line to Forty-second Street by way of Thirty-fifth Street to Twenty-third Avenue to Twenty-eighth Avenue, and thence to Forty-second Street. The company plans the expenditure of $2,000,000 for work to be carried on this year in this city. C.

TECUMSEH, OKLA.—The Rapid Transit & Interurban Company has planned a line from Tecumseh to Sulphur, a distance of fifty-eight miles. The line will pass through Roff and Stratford, each of which has agreed to donate sites, grant franchises for street cars, electric light and power and give a bonus to the company. Sulphur offers the same inducement with a bonus of $40,000. Tecumseh has granted the franchises, but the company has yet to secure bonuses from Tecumseh and some of the smaller towns. When this has been done bonds will be issued for $2,500,000 to provide money with which to build and equip the road. As announced in our issue of January 27, where some of the details are incorrectly stated, J. W. Saxon is president of this company.

PITTSBURGH, PA.—A state charter has been granted to Coraopolis & Woodlawn Street Railway Company. Woodlawn is the home of the $30,000,000 plant of the Jones & Laughlin Steel Company. The proposed line will connect Coraopolis and Woodlawn with Pittsburgh, and at Woodlawn will connect with the Beaver Valley System, operating in Beaver County, including the towns of Rochester, Beaver, Bridgewater, Monaca, Beaver Falls, New Brighton and College Hill. At Beaver connection may be made with the Youngstown & Ohio River Railway, giving direct communication to cities and towns throughout Ohio.

NEW INCORPORATIONS.

LOS ANGELES, CAL.—The Electric Heat Conserving Company has been incorporated by Joseph O. Dimmick, Otis McGuire and Edward L. Olmstead, with a capital stock of $250,000. A.

LAWTON, OKLA.—Independent Electric Supply Company has been incorporated with a capital stock of $1,000. Fred B. Cowell, B. P. Rhinefort and J. S. Rhinefort are the incorporators.

CASTROVILLE, TEX.—The Medina & San Geronimo Company has been formed here with a capital stock of $6,000. The incorporators are H. F. Murzbach, L. F. Murzbach and Ed. Seekatz. D.

DECATUR, ILL.—The Rex Electric Company has been incorporated with a capital stock of $3,000 to do a general electrical contracting business. Earl M. Crawford, Alfred I. Clifford and Earl O. Weatherford are the incorporators.

SAN ANGELO, TEX.—San Angelo Power & Street Railway Company has been incorporated with a capital stock of $100,000. C. C. Kirkpatrick, W. T. Bartholamew and J. D. Snugg are the incorporators.

RACINE, WIS.—The Racine Electric Company has been incorporated with a capital stock of $10,000 by Tally Tolfson, John Ruggaber and William Nelson. The new firm will manufacture electrical appliances.

ST. LOUIS, MO.—The Simon-De Vine Welding Company has been incorporated with a capital stock of $5,000, to do a general welding, plumbing and electrical repair work. The incorporators are Alfred Simon, R. D. Mills and R. S. Mills.

ALBANY, N. Y.—The Havens Electrical Supply Company, Incorporated, has been formed with a capital stock of $25,000. Following are the incorporators: Morton Havens, Jr., William L. Brooks, Albany; Charles J. Bernhardt, New York City.

ALBANY, N. Y.—The firm of Morton Havens, Jr., Incorporated, has been formed for the purpose of carrying on electrical work. The capital stock is $5,000 and the incorporators are Morton Havens, Jr., F. R. Meginniss, Albany, and Thomas G. Grady, Jr., New York City.

CHICAGO, ILL.—The Central Lighting Fixture Company has been incorporated with a capital stock of $3,000 to manufacture and deal in gas and electric lighting fixtures. The incorporators are Jacob E. Rosenfield, Edgar A. Wangersheim and Sydney Stein. Z.

CANADIAN, OKLA. — Oklahoma Modern Electrical Supply Company has been incorporated with a capital stock of $25,000. The incorporators are Fain G. Gillock, H. N. Ames, Canadian; W. E. Crowder, Crowder City; E. C. Brice and W. R. Alexander, Mansfield, Ark.

CHICAGO, ILL.—The Apollo Electric Musical Company has been incorporated with a capital stock of $10,000 to manufacture and operate electric pianos and other musical instruments. The incorporators are William Trimpe, Arthur C. Marriott and Norman Prince. Z.

SPRINGFIELD, O.—The International Automatic Telephone Company has been incorporated with a capital stock of $3,000. William H. Bruce, Jr., Finley O. Cummings, Helen C. Bruce, Henry C. Wiseman and Paul C. Martin are the incorporators. The purpose of the company is to manufacture, lease and sell telephone machinery and equipment.

FINANCIAL NOTES.

An examination of the security list at the end of the week shows in the main a slight decrease. Hardly any of the important industrials made much of a showing, the fluctuations, however, being so slight as to give occasion for no apprehension.

Rail earnings for December, reports of which have recently come to hand, are better than were expected. The report of the steel corporation for the last quarter of 1911, on the other hand, was disappointing.

It is announced that negotiations are under way for the absorption of the United Wireless Telegraph Company by the Marconi Wireless Telegraph Company of London.

It is practically assured that interurban lines contemplating an expenditure of at least $6,000,000 will be built within the next couple of years at Chattanooga, Tenn.

The Eastern Canada Power Company has been incorporated at Montreal to carry out a water power development of 1,000,000 horsepower within twenty-five miles of Montreal.

Dividends.

Boston Elevated Railway Company; semi-annual dividend of three per cent, payable February 15. Lynn Gas & Electric Company; quarterly dividend of $4 per share, payable February 1.

Michigan State Telephone Company; dividend of one per cent on the preferred stock, payable March 30 to stock of record March 15. This dividend is in addition to the one and one-half per cent payable February 1, which was declared in October. Also declared a regular quarterly dividend of one and three-quarters per cent on the common stock payable March 1 to stock of record February 15 and an additional dividend on the common stock for one month at rate of seven per cent per annum, payable March 30 to stock of record March 15. (Directors of the Michigan State Telephone Company have revised the dates of dividend payments so that dividends on both common and preferred will be paid at the end of each calendar quarter, namely March 31, June 30, September 30 and December 31. The rate on the preferred stock has been six per cent per annum and on the common stock seven per cent. To equalize and readjust these conditions, the above dividends have been declared.)

Underground Electric Railways Company, of London, Limited; a dividend at the rate of two per cent per annum on its six-per-cent income bonds for the half year ended December 31, payable March 1. This is the second increase in the rate within a year.

Reports of Earnings.

THIRD AVENUE RAILROAD.

The New York Public Service Commission has made public the report of the receiver of the Third Avenue Railroad Company for the quarter ended September 30, 1911, which compares as follows:

	1911.	1910.
Total operating revenue	$965,116	$918,083
Net operating revenue	549,449	488,981
*Surplus	380,087	328,419

*After deducting charges and taxes, interest permanently defaulted is not included in charges.

BROOKLYN RAPID TRANSIT.

The New York Public Service Commission has issued a report for the lines comprising the Brooklyn Rapid Transit system for the quarter ended September 30, 1911, compared as follows (inter-company transactions not eliminated):

	1911.	1910.
Gross earnings	$6,384,619	$6,016,801
Net earnings	2,877,318	2,753,471

PHILADELPHIA COMPANY.

The Philadelphia Company and affiliated corporations report for the nine months ended December 31, 1911, compares as follows:

	1911.	1910.
Gross earnings	$14,491,215	$14,679,391
Expenses and taxes	8,962,901	8,349,310
Net earnings	5,528,314	6,330,081
Other income	160,623	178,703
Total income	5,688,937	6,508,784
Charges and preferred dividends	3,665,231	3,671,611
Net income	2,023,706	2,837,173
Improvements, betterments, extensions, etc.	880,215	570,568
Surplus	1,143,490	2,266,605
*Proportion due others	2,356	2,397
Available for Philadelphia Company	1,141,135	2,264,208

*Other owners of stock of affiliated corporations

Items representing transactions between companies have been eliminated.

Items representing transactions between companies have been eliminated.

AMERICAN LIGHT & TRACTION.

The American Light & Traction Company reports for the twelve months ending December 31, compared as follows:

	1911.	1910.
Gross earnings	$ 4,144,053	$3,832,551
Expenses	113,810	119,688
Net earnings	4,030,242	3,712,863
Surplus and resources previous year	6,862,631	5,999,064
Total surplus	10,892,874	9,711,928
Cash dividends on preferred stock	854,172	854,172
Cash dividends on common stock	1,101,387	997,559
Stock dividends on common stock	1,101,587	997,565
Total dividends	3,057,147	2,849,296
Profit and loss surplus	7,835,726	6,862,631

NORTHERN OHIO TRACTION & LIGHT COMPANY.

The Northern Ohio Traction & Light Company has issued its full pamphlet report for the year ended December 31, 1911. The income account compares as follows:

	1911.	1910.
Gross	$2,694,024	$2,437,426
Expenses and taxes	1,492,526	1,348,963
Net	1,201,498	1,088,463
Charges	531,032	521,069
Surplus	*670,465	567,393
Dividends	292,500	225,000
Surplus	377,965	342,393
Previous surplus	1,074,812	947,166
Total surplus	1,452,778	1,289,559
Depreciation, etc.	294,866	214,748
Profit and Loss surplus	1,157,911	1,074,812

*Equal to 6.78 per cent on $9,000,000 common stock after allowing for six per cent on the $1,000,000 preferred stock outstanding. This compares with 6.3 per cent earned on $9,000,000 common stock previous year.

UNITED RAILWAYS OF ST. LOUIS.

For the year ended December 31, the United Railways of St. Louis earned 7.5 per cent on the $16,383,200 preferred stock, which does not include $3,603,300 preferred stock held in the treasury of the company. This compares with 5.2 per cent earned on $16,983,200 the previous year. The income account compares as follows:

	1911.	1910.
Gross earnings	$11,914,153	$11,537,774
Expenses, taxes and depreciation	7,990,062	7,906,103
Net	3,924,091	3,631,671
Other income	44,729	43,067
Total income	3,968,820	3,674,738
Charges	2,740,305	2,793,743
Balance	1,228,515	880,995
Preferred dividends		407,580
Surplus	1,228,515	471,415

UNITED ELECTRIC SECURITIES.

The United Electric Securities Company has issued its report for the twelve months ended December 31, 1911, which compares with the eleven months ended December 31, 1910, as follows:

	1911.	1910.
Gross income	$ 445,346	$ 336,869
Expenses and taxes	257,671	222,513
Net income	187,675	114,356
Previous surplus	1,329,193	1,314,719
Profit sale of securities	75,592	70,018
Total surplus	1,592,460	1,499,093
Dividends	195,000	195,000
Balance	1,397,460	1,304,093
Adjustment, debit	56,280	†25,100
Profit and loss surplus	1,341,180	1,329,193

†Credit. *Eleven months.

CHICAGO CITY & CONNECTING RAILWAY.

The report of the Chicago City & Connecting Railway Company for the year ended December 31, 1911, compares as follows:

	1911	1910.
Dividends	$2,537,968	$2,361,828
Interest	74,703	225,665
Gross income	2,612,672	2,587,493
Total disbursements	1,148,762	1,136,791
Net income	1,463,909	1,450,701
Dividends on part shares	1,425,000	1,425,000

TWIN CITY RAPID TRANSIT COMPANY.

The Twin City Rapid Transit Company has issued its pamphlet report for the year ended December 31, 1911. The income account compares as follows:

	1911.	1910.
Gross	$7,811,193	$7,531,649
Expenses	3,906,716	3,667,702
Net	3,904,477	3,863,946
Interest and taxes	1,486,129	1,466,391
Surplus	*2,418,348	2,397,552
Dividends	1,416,000	1,416,000
Surplus	1,002,348	981,552
Applied for renewals	750,000	736,000
Surplus	252,348	245,552

*After allowing seven per cent dividends on the $3,000,000 preferred stock, the balance, $2,208,348, before deducting depreciation is equal to 10.98 per cent on the $20,100,000 common as compared with 10.88 per cent earned on same stock previous year.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 5	Jan. 29.
Allis-Chalmers common (New York)	1	1
Allis-Chalmers preferred (New York)	6	8
American Tel. & Tel. (New York)	139½	139¾
General Electric (New York)	156¾	157¾
Kings County Electric (New York)	129	129
Postal Telegraph and Cables common (New York)	75	76
Postal Telegraph and Cables preferred (New York)	70¼	69¼
Western Union (New York)	82¼	82
Westinghouse common (New York)	70	71
Westinghouse preferred (New York)	114	118
Edison Electric Illuminating (Boston) (ex-dividend)	297	299
Massachusetts Electric common (Boston)	21	22
Massachusetts Electric preferred (Boston)	94¾	96
New England Telephone (Boston)	161	161
Electric Company of America (Philadelphia)	11⅝	12
Electric Storage Battery common (Philadelphia)	53¼	55¼
Electric Storage Battery preferred (Philadelphia)	53¼	55¼
Philadelphia Electric (Philadelphia)	18	18¼
Chicago Telephone certificates (Chicago)	137½	141
Commonwealth Edison (Chicago)	139	139
National Carbon common (Chicago)	105	106
National Carbon preferred (Chicago)	115	117½

PERSONAL MENTION.

WILLISTON FISH, assistant to President Roach of the Chicago Railways Company, has been appointed general manager.

R. B. HOOVER, of the Central Union Telephone Company, Springfield, Ohio, has been appointed an aide-de-camp of the staff of W. H. Trimble, Commander of the National Grand Army of the Republic, Chicago.

J. M. WARD, of the Waverley Company, has been appointed secretary of the Indiana Auto Manufacturers' Association, in succession to P. P. Willis. It was Mr. Ward who drove the Waverley over the 1,400-mile run last summer.

HACKETT BARBEE, for several years connected with the Nashville office of the Cumberland Telegraph & Telephone Company, has been transferred to Chattanooga, as assistant to the manager of the local office.

H. W. GRIFFITH, Indianapolis, Ind., formerly with the American Creosoting Plant, Chicago, has been made general manager of the Remy Electric Company, to succeed M. I. Poland, who will take up the manufacture of an automobile starter.

ERNEST RITTER, Allentown, Pa., who has been district manager for the Bell Telephone Company for nearly four years, has resigned his position with that company to become business manager of *The Daily City Item* and the *Allentown Democrat.*

ALPHA H. KLING, secretary and treasurer of the Detroit Fuse & Manufacturing Company, Detroit, will spend the next three months abroad visiting London and the Continent. Mr. Kling has been a hard worker for a number of years, and will now take a well earned rest.

FRANK S. WHITMAN, Baltimore, Md., who has been contract manager of the Baltimore Division of the Potomac Telephone Company, has been promoted to manager of the entire Baltimore Division. S. J. Blight, formerly cashier, has been appointed to succeed Mr. Whitman.

B. H. GARDNER, who for a long time has been sales manager of the Dayton Power & Light Company, has resigned his position with that company to become sales manager of the United Electric Light & Water Company, with headquarters at Waterbury, Conn. J. C. Matthieu, an electrical vehicle and power expert, succeeds Mr. Gardner with the Dayton Power & Light Company. Mr. Gardner was presented with a beautiful gold watch by his fellow office employees of the Dayton Power & Light Company and with a handsome traveling bag from the company itself.

FRANK F. FOWLE announces that he is about to close his business as a consulting electrical engineer in Chicago, and will become associated with the McGraw Publishing Company as an associate editor of the *Electrical World,* with headquarters in New York. Mr. Fowle will leave Chicago about the middle of February. Frank F. Fowle is one of the leading authorities in this country on public-service reports, investigations, tests and approvals, and has undertaken some of the most conspicuous work in the West respecting specifications, plans and supervision of construction. He has made a special study of rate-making and operating efficiency. He has a host of friends and has won the esteem of all who known him by strict adherence to a policy of rigid accuracy and straightforwardness in investigation and report. He is a member of several of the national and state engineering and scientific societies, and retires this month from the vice-presidency of the Electric Club of Chicago. For the last half-year Mr. Fowle has served the club very capably as chairman of the Speakers Committee. He will leave Chicago with the good wishes of the entire electrical fraternity.

G. M. GEST, the well known conduit engineer and contractor, recently lectured before the electrical section of the Canadian Society of Civil Engineers at Montreal, and before the Toronto Section of the American Institute of Electrical Engineers on the subject of "Underground Conduit Work." Mr. Gest showed that underground construction for electric wires was suggested as early as 1867, the practical application of the principle, however, waiting until 1881, when several miles of underground work was installed at London, England. The great desirability of separating groups of wires carrying different voltages was brought out by Mr. Gest, and the substantial isolation effected by stout concrete walls was well shown by a series of lantern slides. He also showed the desirability of departing from the common European method of making the ducts water tight, preferring that the conduits should be installed so as to drain to the manholes. Actual installation work in progress in both England and the United States was illustrated by moving pictures, and the lecture in each case was greatly enjoyed. The scientific methods employed by Mr. Gest and the evidence of rapidity and solidity of construction elicited the hearty commendation of those in attendance.

PROPOSALS.

ELECTRICAL SUPPLIES.—Proposals will be received until February 27 by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., for the following material. Schedules may be obtained from the Navy Pay Office nearest each Navy Yard. In making application the schedule number should be given.

Article	Quantity	Delivered at Navy Yard	Schedule
Cable, interior communication	4,000 feet	Brooklyn, N. Y.	4338
Conductor, twin	11,000 feet	do.	4338
Conduit, iron, enamaled	500 feet	Lake Denmark, N. J	4333
Gears, telephone head	50 sets	Brooklyn, N. Y.	4338
Wire, telephone	4,000 feet	do.	4338

Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until February 15 for electric conduits, wiring and lighting fixtures of a one-story and basement building for the Post Office at Bonham, Tex.; until March 4 for electric conduits, wiring and interior lighting fixtures of a one-story and basement building for the Post Office at Virginia, Minn.

Sealed proposals will be received at Fort Monroe, Va., until February 15 for electric wiring and fixtures for the addition to the post hospital. For the benefit of bidders in and about New York plans and specifications may be seen in the office of the chief quartermaster, Eastern Division, Governor's Island, New York. Deposit of certified check for $50 required as guaranty of return of plans.

ELECTRICAL CONTROL APPARATUS.—Sealed proposals will be received at the office of the general purchasing officer, Isthmian Canal Commission, Washington, D. C., until March 1 for furnishing general control apparatus, including starting panels for all motors, which are to be controlled from a remote point; limit switches, commutating switches used in the miter-gate control, auxiliary cutout switches for miter-gate strut, handrail controllers, miscellaneous remote indicators and indicator controllers, control switchboard for all locks and spillways and control and indicating apparatus for the chain fenders, as per Canal Circular 679.

FOREIGN TRADE OPPORTUNITIES.

(Parties interested in the following item should address the Bureau of Manufactures, Washington, D. C., and refer to the file number noted.)

NO. 7971. POWER INSTALLATION.—The Swedish government invites tenders for the installation of an electrical power plant of 600 horsepower for the treatment of iron ore. No particulars are given, and it is understood that tenders will be received through local agents only.

Dates Ahead.

Wisconsin State Telephone Association. Annual meeting, Madison, Wis., February 14-15.

Engineering Society of Wisconsin. Annual meeting, Madison, Wis., February 14-16.

National Electrical Supply Jobbers' Association. Hollenden Hotel, Cleveland, O., February 13-15.

New England Section of the National Electric Light Association. Annual meeting, Hotel Kimball, Springfield, Mass., March 21-22.

Northwestern Electric Show. Minneapolis, Minn., March 16-23.

National Railway Appliances Association, Inc., Chicago, Ill., March 18-23.

American Railway Engineering and Maintenance of Way Association. Chicago, Ill., March 19-21.

Minnesota Electrical Association. Minneapolis, Minn., March 20-22.

Southwestern Electrical and Gas Association, San Antonio, Tex., April 25-27.

National Electric Light Association, Annual convention, Seattle, June 10-14.

Michigan Section of the National Electric Light Association. Annual convention, on board the *Majestic,* sailing from Port Huron, Mich., about June 21.

American Institute of Electrical Engineers. Annual convention, Boston, Mass., June 25-28.

National Electrical Contractors Association. Annual meeting, Denver, Colo., June 17-20.

The 1912 Boston Electric Show. Mechanics Building, Boston, Mass., September 28-October 26.

With the Electrical Manufacturers

The Westinghouse Air Brake & Traction Brake Company has removed the office of its southeastern manager, E. A. Craig, from the general office at Wilmerding, Pa., to 308 Westinghouse Building, Pittsburgh, Pa.

The McRoy Clay Works, Rookery Building, Chicago, makers of the well known McRoy conduits, have distributed their February blotters on which are given some potent reasons why every American should be proud of his country.

Leo Popper & Sons, 145 Franklin Street, New York City, importers of glass, are now manufacturing a number of special sheet glasses for correcting colors and diffusing light. Some of these have an absorption of only 10 to 12 per cent.

The Busch—Sulzer Brothers—Diesel Engine Company, St. Louis, Mo., has begun work on its factory to be located at Utah and Second Streets. The ground required covers over eight acres and cost $173,000. The factory will be completed this year.

The Connecticut Telephone & Electric Company, of Meriden, Conn., has opened an office at 231 West Fifty-fourth Street, New York City, where a complete and well assorted emergency stock of its ignition devices is to be carried regularly.

The Walpole Rubber Company, 80 Reade Street, New York City, is distributing a strikingly attractive wall calendar for 1912, showing a statuesque red-robed figure of progress and prosperity surrounded by evidences of both these achievements.

The New York Insulated Wire Company, 114 Liberty Street, New York City, calls attention on its February blotters to its facilities for furnishing rubber-covered wire conforming to the new Code specifications, and to the merits of its rubber and friction tapes.

W. N. Matthews & Brother, St. Louis, Mo., have moved their office and factory to their new building at 3722 Forest Park Boulevard. The increased and improved facilities thus made available will enable them to give still more prompt attention to orders than heretofore.

Arthur S. Partridge, 417 Pine Street, St. Louis, Mo., has ready for distribution his latest list of second-hand electrical, steam and gas machinery. This list covers a great stock of gas and steam engines and their auxiliaries, direct-current and alternating-current generators chiefly direct-connected, street cars, railway equipment, etc.

The James Clark, Jr., Electric Company, Louisville, Ky., has issued a 54-page catalog descriptive of the Willey electrically driven tools, dynamos and motors. Among these is a varied assortment of electric drills, grinders, buffers and other tools, direct-connected engines and dynamos, direct-current and alternating-current generators and motors.

The Reynolds Electric Flasher Manufacturing Company, 617 West Jackson Boulevard, Chicago, has issued bulletin and price list No. 18, giving special prices on Reco flashers for electric signs and displays of every description. This catalog indicates that some of the most remarkable effects can be secured at a very low price, and the bulletin also shows a considerable reduction in the list price of several types. This bulletin will be sent to those interested upon request.

The Wirt Electric Specialty Company, Germantown, Philadelphia, Pa., has prepared an interesting booklet to illustrate and explain some of the advantages of its Dim-a-lite attachment for dimming an electric light. Its pull cord permits five changes of light, namely, full, dim, low, night light and out. It is readily screwed into any socket and the lamp then screwed into it; thus any ordinary incandescent lamp may be used. The company is prepared to send Dim-a-lites out on approval.

The Emerson Electric Manufacturing Company, St. Louis, Mo., has ready for distribution among those interested its 1912 catalog of Emerson and Trojan fan motors for alternating and direct currents. This is a handsomely prepared book of 64 pages in which the company's 30 odd standard types of fans are fully illustrated and described. Among these are seven new types of direct-current fans and a complete line of three-speed induction-motor fans in both swivel-trunnion and oscillating types.

The Ferro Machine & Foundry Company, Cleveland, Ohio, has just issued its 1912 catalog of Ferro internal-combustion marine engines. The company is justified in calling this 48-page catalog a practical treatise, because it is unique in the scope and clearness of its explanatory matter. Every part of the engine is described in detail and its specific function and relation to the entire machine fully explained with the aid of copious illustrations that are models of the engraver's art. The engines are made up to 25 horsepower in capacity and are specially designed for launch and motor-boat service.

The General Vehicle Company, Long Island City, N. Y., has made record sales of commercial electric trucks during January. The sales for the month total 158 trucks. The Jacob Ruppert Brewing Company ordered 21 trucks, making 72 in all used by this company; the Doelger Brewing Company ordered 8, making 47; the Muehlbach Company ordered 7, making 10; the Commonwealth Edison Company ordered 9, making 15. An initial order of 8 has been secured from the Schaefer Brewing Company, and an initial order of 10 from the General Baking Company. Sixty-nine per cent of the General Vehicle Company's 1911 business was in repeat orders, and February 1 finds the company with a record of 671 electric trucks bought by 25 customers alone.

The Macbeth-Evans Glass Company, Pittsburgh, Pa., has published a valuable primer entitled "Sientific Illumination." This well illustrated 48-page book is practically a pioneer in explaining in a simple way the principles of good lighting so that a layman may readily grasp them and at the same time get a good idea of the materials that are now employed. Although naturally emphasizing the advantages of Alba glassware, the chapter dealing with shades and reflectors is quite fair, as is every portion of the book. The subject matter deals with electric lighting and is condensed into very pithy form, thus making it a double pleasure to find so much valuable information clearly stated in so compact a form. The company deserves commendation for this educational publication, which should be in the hands of all having responsible charge of lighting installations.

The H. W. Johns-Manville Company, New York, N. Y., has acquired the sole selling agency for the entire products of I. P. Frink. The company is already well known in the lighting field by reason of its J-M Linolite system of illumination and the Frink reflectors need no introduction to the lighting trade and consumers throughout the country. This arrangement means that the H. W. Johns-Manville Company will be in a position to design and sell lighting systems for every form of artificial illumination. An engineering department will be maintained along extensive lines, backed up by a corps of engineers throughout the United States and Canada. The company will thus be equipped to place data and recommendations in the hands of anyone interested in any subject pertaining to illumination. The rapidly increasing demand in Pittsburgh and vicinity for the products of the H. W. Johns-Manville Company has necessitated a removal of the Pittsburgh branch to larger quarters. The company now occupies the entire eight-story stone, reinforced-concrete and steel building at the northeast corner of Wood Street and First Avenue, which has been leased for a term of years. This building totals in gross floor space approximately 23,808 square feet, and is one of the most substantial structures in the downtown section of Pittsburgh.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued folder No. 4222 on economy coils for tungsten display lighting. These are used for reducing the voltage from 110 or 220 volts to that suitable for tungsten sign lamps,

Descriptive leaflet No. 2299-A describes Westinghouse type HF slip ring induction motors. These motors are designed for service where excessively heavy loads must be started with low starting current. Leaflet No. 2386 describes Westinghouse heavy-duty type NW slip-ring induction motors. These are especially suitable for severe intermittent varying-speed service, such as for operation of cranes, hoists, elevators, railway turntables and similar installations. Leaflet 2387 describes Westinghouse type MS alternating-current motors which are designed for driving passenger and freight elevators whose speeds are below 150 feet per minute.

Record of Electrical Patents.

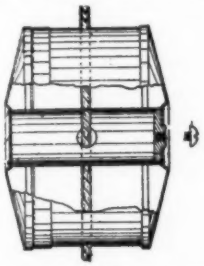
Issued by the United States Patent Office, January 30, 1912.

1,015,768. Automatic Telephone Circuit and Repeater. C. Adams-Randall, assignor to Randall Telephone Manufacturing Co., Augusta, Me. Has a repeater and a condenser in series with each main line, the repeating circuit being connected in shunt between the condensers.

1,015,769. Telephone Circuit and Repeating Apparatus. C. Adams-Randall, assignor to Randall Telephone Manufacturing Co. The repeating apparatus is connected to the lines at an intermediate station through spring jacks and plugs.

1,015,770. Multiple Repeating Telephone System. C. Adams-Randall, assignor to Randall Telephone Manufacturing Co. Each main line may be connected to a local circuit and repeater.

1,015,778. Automatic Electrical Signaling Apparatus for Railways. R. P. Brousson, assignor to Automatic Electric Block Signalling Co., London, England. A block system in which the signals are controlled by relays and automatic switches.



1,015,828.—Lamp-Cord Adjuster.

1,015,787. Magnet-Actuated Device. D. H. Darrin, New York, N. Y. The upward pull of a solenoid core causes a weighted arm to oscillate from side to side and thus open and close a pair of contacts.

1,015,788. Spark Generator for Internal-Combustion Engines. I. M. Davidson, Neeleyville, Mo., assignor of part to W. B. Davis and C. I. Davis, Clinton, Mo. Includes a rotatably actuated circuit-breaker.

1,015,789. Fire-Alarm System. D. G. Dee, assignor to Denio General Electric Co., Rochester, N. Y. A combined telephone and closed-circuit fire-alarm system.

1,015,807. Combined Cigar Lighter and Advertising Machine. A. J. Kobler, New York, N. Y. Associated with an electric cigar lighter is a rotatable transparent cylinder within which is an electric lamp and some advertising matter.

1,015,809. Cable Clamp for Electric Elevator Circuit-Breakers. A. H. Lowe, St. Louis, Mo. The clamp has two sections adapted to be secured as a sleeve to the cable.

1,015,818 and 1,015,819. Casting Machine. J. A. McManus, Jr., Lynn, Mass. The mold is slowly and evenly electrically heated and the metal to be cast is heated by playing an electric arc upon it.

1,015,828. Lamp-Cord Adjuster. C. G. Ochiltree, Seattle, Wash. The cord is adapted to be wound upon a central spindle within an inclosed cylindrical shell.

1,015,837. Automatic Stabilizer for Aeroplanes and the Like. P. L. A. Regnard, Paris, France. An electrically operated gyroscope.

1,015,843. Spark Plug. A. Schmidt, assignor to Champion Ignition Co., Flint, Mich. Includes a coiled spring back of the central electrode.

1,015,863. Apparatus for Galvanizing Metal Tubes, Rods and the Like. F. Werth, Milan, Italy. An endless chain carries the tubes or rods down through the electrolyte tank.

1,015,869. Mechanical Movement. T. A. C. Both, assignor to I. S. Rosenheim, New York, N. Y. A pendent switch has a rocking bridge member actuated by push-buttons.

1,015,881. Means for the Transmission of Energy by Electromagnetic Waves. R. A. Fessenden, assignor to National Electric Signaling Co., Pittsburgh, Pa. In the circuit of a generator capable of sending out a continuous train of waves is a telautograph to modify the waves sent out from the antenna.

1,015,891. Process of Separating Glutamic Acid and Other Products of Hydrolysis of Albuminous Substances From One Another by Electrolysis. K. Ikreda and S. Suzuki, Tokyo, Japan. The electrolytic cell is divided into three compartments, one receiving the bases around the anode, the other the acids at the cathode and the intermediate space the neutral products.

1,015,897. Attachment for Incandescent-Lamp Sockets. N. Klein, assignor to Harvey Hubell, Incorporated, Bridgeport, Conn. A pull-chain socket switch.

1,015,901. Electrically Operated Hoisting Apparatus. F. E. Lutz, Philadelphia, Pa. A cam operates a tripping switch that reverses the connections to the motor armature.

1,015,912. Induction-Motor Winding. C. W. Starker, assignor to Westinghouse Electric & Manufacturing Co. Consists of a number of short-circuited, diamond-shaped coils with their end portions grouped, and end rings having spaced holes through which the coil-end groups project.

1,015,923. Electric Heater for Pipe-Thawing. T. Abtmeyer, assignor to Westinghouse Electric & Manufacturing Co. Has a handle attached to two semi-cylindrical shells containing an insulated resistance element.

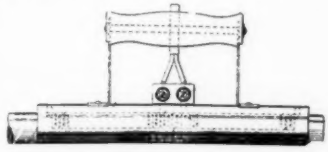
1,015,925. Solenoid. C. J. Anderson, assignor to J. L. Schureman Co., Chicago, Ill. In the path of movement of the core is a sectional plug.

1,015,929. Method of and Apparatus for Preventing Gas Explosions. G. Baehr, assignor to National Tube Co., Pittsburgh, Pa. When the flow of gas from a gas tank to a gas engine is stopped, the ignition circuit of the latter is broken and a circuit-breaker in the circuit of the generator it drives is opened.

1,015,930. Safety Device for Gas Mains and Holders. G. Baehr, Ampere, N. J., assignor to National Tube Co. An amplification of the above.

1,015,937. Life-Saving Apparatus. D. Brevetti and C. Fucci, New York, N. Y. A life chute attached to a building has a body arrester at its bottom which closes an electric signal circuit.

1,015,953. Matrix-Drying Press. W. S. Hadaway, Jr., assignor to Westinghouse Electric & Manufacturing Co. The working-surface plate is electrically heated and electrically moved.



1,015,923.—Electric Pipe-Thawer.

1,015,954. Cutout for Electric Sadirons. W. S. Hadaway, Jr., assignor to Westinghouse Electric & Manufacturing Co. Has a heat-released latch and a single spring in the handle for actuating the circuit-interrupter and for returning the latch to its normal position.

1,015,958. Mercury Converter. R. B. Ingram, assignor to Westinghouse Electric & Manufacturing Co. The alternating-current terminals are inclosed in special tubes.

1,015,963. Incandescent Lamp Socket. P. Kleber, Wiesbaden, Germany, assignor of one-half to H. Zirwas, Yonkers, N. Y. About the cap is a two-part reflector or shade-holder.

1,015,968. Alternating-Current Electromagnet. E. Lehr, assignor to Westinghouse Electric & Manufacturing Co. Resistance can be inserted in the circuit of a control magnet to

prevent the armature and core from sticking.

1,015,972. Electric Switch. W. A. Paris, assignor to Westinghouse Electric & Manufacturing Co. A solenoid switch with blow-out magnet coils.

1,015,974. System of Electrical Distribution. J. S. Peck, assignor to Westinghouse Electric & Manufacturing Co. A three-wire alternating-current system has an auxiliary balancing transformer whose secondary may be automatically short-circuited.

1,015,991. Electric Heating Pad. W. S. Clark, assignor to General Electric Co. Comprises a resistance conductor imbedded in a body of flexible rubber.

1,015,992. Electromagnet. C. W. Coleman, assignor to Hall Signal Co. A slow-release magnet has a secondary winding for retarding its magnetic action.

1,015,999. Pendent Snap Switch. F. C. De Reamer, assignor to General Electric Co. Has a crosswise reciprocating actuator.

1,016,003. Means for Transmission of Intelligence. W. E. Frow, Lisbon Falls, Me. A system for sending wireless messages below ground has a number of divergent ground connections, disposed in radial lines from the central ground.

1,016,005. Dynamo-Electric Machine. H. Geisenhoner, assignor to General Electric Co. The stator of a vertical-shaft turbo-generator is cooled by circulating water through special passages among its core laminations.

1,016,016. Trolley-Wire Connector. J. Kirby and J. Mayo, Douglas, Ariz. Consists of two parts, each with a tapered lip and wire-receiving receptacle.

1,016,021. Alternating-Current Dynamo. M. C. A. Latour, assignor to General Electric Co. A single-phase commutator motor with the primary of a transformer in series with its stator and the secondary of the transformer connected to opposite brush sets, intermediate bushes of the motor being short-circuited.

1,016,025. Pressure-Controlling Mechanism. J. S. McWhirter, assignor to General Electric Co. An auxiliary switch controlled by variations in pressure is arranged to either close the main switch or short-circuit its retaining magnet.

1,016,035. Sound-Producing Device. B. P. Remy and F. I. Remy, assignors to Remy Electric Co., Anderson, Ind. The armature of an electromagnet carries a striker.

1,016,036. Signaling and Telephone System. H. O. Rugh, assignor to Sandwich Electric Co., Chicago, Ill. Selective signaling for a party line.

1,016,037. Electric-Lighting System for Vehicles. S. W. Rushmore, Plainfield, N. J. Includes a generator driven at varying speed, a storage battery, a ballast for absorbing the excess voltage of the dynamo, and an automatic regulator and switch.

1,016,059. Motor-Controlling Device. T. E. Barnum, assignor to Cutler-Hammer Manufacturing Co., Milwaukee, Wis. An electromagnetically operated controller for periodically reversing a motor.

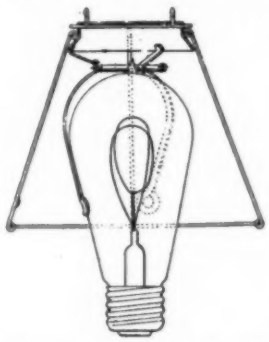
1,016,060. Motor Controller. T. E. Barnum, assignor to Cutler-Hammer Manufacturing Co. An automatic rheostat removes resistance from the field circuit when the motor load increases.

1,016,071. Electric Switch. J. T. Janette, assignor to Cutler-Hammer Manufacturing Co. An electromagnet is adapted to force the switch-operating member to turn on a different pivot from that normally used.

1,016,077. Package for Tungsten Lamps. W. Lumley, East Conneaut, O., assignor to Conneaut Co. The lamps are shipped within cartons that are suspended by elastics from the sides of a packing crate.

1,016,095. Splicing Sleeve. J. Riddell, assignor to General Electric Co. Has side slots and a central chamber with its ends closed by integral tongues.

1,016,097. Process of Purifying Electrically Conductive Materials. C. C. Ruprecht, Cleveland, O. Consists in



1,016,223.—Shade-Holder or Guard.

reducing the materials to a fluid condition, rotating the fluid mass, and passing an electric current radially through it.

1,016,099. Electric Incandescent Lamp. O. Schaller, Sudende, near Berlin, Germany. Comprises a globe having transversely arranged plain flat surfaces, and feed conductors having corresponding surfaces, the parts being held together solely by atmospheric pressure.

1,016,131. Telephone Disconnector. C. G. Fields, Bucklin, Mo. A stem forming part of the circuit carries at its outer end a pair of forked arms engaging a line wire through a hook lever.

1,016,136. Key Socket. E. H. Freeman, Trenton, N. J. Has a combined center plug contact and snapper spring.

1,016,138. Combined Electric Hair Brush and Comb. H. Gernsback, New York, N. Y. The back of the brush, which has metallic bristles, carries an induction coil.

1,016,202. Telephone and Telegraph Combination System. C. L. Bopp, Hawkeye, Ia., assignor of parts to F. Straate and J. Moran, Waukon, Ia. The telegraph set includes a polarized relay to suppress telephone currents from the set.

1,016,205. Pilot-House Light. J. H. Buxbaum, Seattle, Wash. The compass binnacle is illuminated by an electric lamp whose light is concentrated upon a small area of the compass.

1,016,223. Shade-Holder or Guard for Incandescent Lamps. W. Ifland, New York, N. Y. A set of wire fingers is clasped over the upturned end of the lamp and carries a shade-holder or guard ring.

1,016,227. Safety System for Railways. A Minnick, Coeur d'Alene, Idaho, assignor to Minnick Automatic Train Controller Co. An electric system with two sectional conductors along the track. The train-controlling means are rendered active only when the sectional-conductor circuit is complete.

1,016,240. Apparatus for Steering Moving Objects, Particularly Ships and Flying Machines. V. Alexieff, Enseli, Persia. An intricate electrical system including selenium cells, projecting lamps, two gyroscopes, a geographical chart with electric contacts, and an electric motor operating the rudder.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired February 5, 1912:

533,427. Automatic Telephone Switch Henry D. Bayne, Brooklyn, N. Y.

533,434. Rosette for Electric Lighting. Elisha W. Buffington, Fall River, Mass.

533,445. Electric Dental Motor Apparatus. Francis N. Denison, Toronto, Canada.

533,447. Electric Railway. John G. Douty, Williamsport, Pa.

533,459. Electrically Lighted Buoy. Ira W. Henry, New York, N. Y.

533,490. Electric Fire-Alarm and Police-Signal Box. George E. Paynter, and William H. Thompson, Richmond, Va.

533,502. Method of and Means for Testing Incandescent Lamps. Frank S. Smith, Pittsburgh, and James A. Vandergrift, Allegheny, Pa.

533,583. Brush for Dynamo-Electric Machines. Joseph W. Dickey, New York.

533,598. Running Gear for Electric Cars. Charles A. Jackson, Reading, Mass.

536,610. Conduit Electric Railway. Alfred Rosenholz, San Francisco, Cal.

533,627. Conduit Electric Railway. William H. Baker, Pawtucket, R. I.

533,631. Subway for Electric Railways. Frank E. Button, Rochester, N. Y.

533,670. Lock for Electric Lamps. Warren A. Saul and Jacob H. Peck, Steelton, Pa.

533,698. Safety Connection for Electric Conductors. Ralph E. Bates, Brooklyn, N. Y.

533,729. Telephonic or Analogous Electrode. Thomas McCoubray, New York, N. Y.

533,785. Telephone Exchange. Morgan Brooks, Minneapolis, Minn.

533,795. Electric Broiler or Toaster. Levi T. Edwards, Haverford, Pa.

533,836. Conduit System. Charles M. Yost, Washington, D. C.

533,853. Cover for Electric-Light Globes. Hans Johansen, Chicago, Ill.